TRANSMISSION TEST SET
MODEL 100R-4
SERVICE MANUAL

12-2

TRANSMISSION TEST SET

MODEL 100R-4

SERVICE MANUAL

MetroTel Corp

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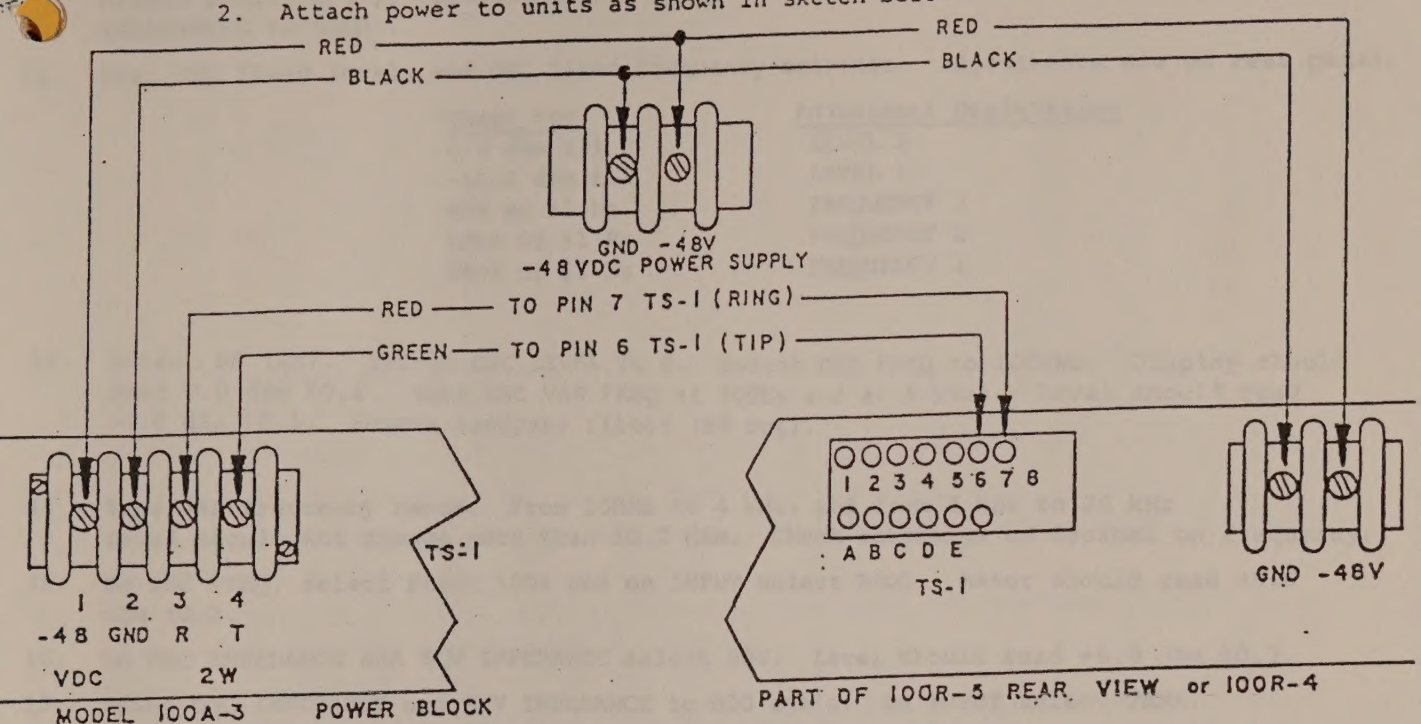
MODELS 100R-4/1771 FINAL Q.C. SALES TEST PROCEDURES

1. Visual Inspection.
2. Attach power to units as shown in sketch below:



3. SELECT:

Top Row Settings	Bottom Row Settings
RCV/SEND to RCV	600, TERM, LEVEL
NORM/XFR to NORM	1010 Notch (out)
ON/OFF to OFF	N/G (out), BP (out)
S/R/DIAL to S/R	Speaker Volume Off
IMPEDANCE to 600	
OSC LEVEL to VAR (-40, +10)	
OSC FREQ to 1004	

4. Insert 310 patch cord from SEND to RCV jack.
5. Turn power on by switch on rear panel. Turn power supply on.
6. Check LEVEL range from -40.0 to +10.0 dBm (watch for frequency counter stability throughout range).
7. Transfer 310 patch cord from SEND jack to reference generator output after setting reference generator to 1004Hz at 0.7746 Volts. If LEVEL does not read 0.0 dBm 0 adjust "A" potentiometer on rear panel for LEVEL reading of 0.0 dBm.
8. Select 900 RCV IMPEDANCE, set reference generator output to 0.9486 Volts. If LEVEL does not read 0.0 dBm ±0, adjust "C" potentiometer on rear panel for LEVEL reading of 0.0 dBm. Return RCV IMPEDANCE selection to 600.
9. Transfer 310 patchcord from RCV Jack to SEND Jack. LEVEL should be - blank. Depress NORM/XFR to select XFR (in), LEVEL should now read 0.0 dBm. Transfer 310 patchcord from SEND jack to RCV jack. Level should be - Blank. Switch NORM/XFR to NORM (out) Level should now read 0.0 dBm. Remove 310 patchcord from Reference Generator and reinsert in SEND jack.

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± .005 ±		DESIGN DEVELOPMENT INC SAN JOSE, CALIFORNIA	
APPROVALS	DATE	MODEL 100R-4 FINAL Q C TEST	
DRWN Lmm	6-26-84		
CHECKED		SCALE +	SIZE A
		DRAWING NO 79-7100-1804	
ISSUE		DO NOT SCALE DRAWING	SHEET 1 OF 4

10. Switch RCV/SEND to SEND (in). Select 900Ω OSC IMPEDANCE and 900Ω RCV IMPEDANCE. Switch OSC LEVEL to 0. LEVEL should read 0.0 dBm ±0.1. Return RCV/SEND to RCV (out).

11. On INPUT, select BGDG. Select VAR OSC LEVEL. Increase LEVEL control until display blanks positive (+). Display should blank at +15.0 dBm. Return INPUT to TERM and IMPEDANCES to 600Ω .

12. Test OSC fixed levels and OSC fixed frequency settings. Adjustments are on rear panel.

Check For	Adjustment Designation
0.0 dBm ±.1	LEVEL 2
-16.0 dBm ±.1	LEVEL 1
404 Hz ±1 Hz	FREQUENCY 3
1004 Hz ±1 Hz	FREQUENCY 2
2804 Hz ±1 Hz	FREQUENCY 1

13. Select BP (in). Switch OSC LEVEL TO 0. Switch OSC FREQ to 1004Hz. Display should read 0.0 dBm ±0.1. (Set OSC VAR FREQ at 200Hz and at 5 kHz). Level should read -3.0 dBm ±0.5. Remove bandpass filter (BP out).

14. Test VAR frequency range. From 100Hz to 4 kHz, and from 4 kHz to 20 kHz. Level should not change more than ±0.2 dBm. Check autorange of decimal on frequency.

15. On OSC FREQ, select fixed 1004 and on INPUT select BRDG. Meter should read +6.0 dBm ±0.3.

16. On OSC IMPEDANCE and RCV IMPEDANCE select 900. Level should read +6.0 dBm ±0.3.

17. Reset OSC IMPEDANCE and RCV IMPEDANCE to 600 again. On INPUT select TERM. Select 1010 NOTCH (in). Readings are as follows:

SELECTION	RESULTS
CMSG + 1010 NOTCH	+32 or below
3 kHz + 1010 NOTCH	+35 or below
15 kHz + 1010 NOTCH	+40 or below

Readings observed should not fluctuate more than 1 digit. Select 1010 NOTCH (out).

18. On OSC LEVEL select VAR (-40, +10), on RCV select LEVEL. Reset VAR LEVEL to +0.0 dBm.

19. Connect HP attenuator between SEND and RCV jacks. Check level tracking. Requirements are as follows:

Attenuator Setting	Meter Displays	
0.00	0.0 dBm	1004 Hz
10.0	-10.0	1004
20.0	-20.0	1004
30.0	-30.0	1004
40.0	-40.0	1004
50.0	-50.0	1004

All readings are ±0.1. Unit will blank at -50.1 dBm.

20. Reset attenuator to 0.0. Select CMSG filter:
    a) Select OSC FREQ - 404 Hz - meter reads +79 ±1
    b) Select 3 kHz filter - meter reads +90 ±1
    c) Select CMSG filter, Select OSC FREQ - 2804 Hz - meter reads +88 ±1
    d) Select 3 kHz filter - meter reads +88 ±1 dBrn
    e) On OSC FREQ select VAR. On RCV select LEVEL. Set VAR Frequency to 15 kHz, Select 15 kHz filter. Meter reads +87 ±1 dBrn.

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS ONE PLACE ± 0.005		DESIGN DEVELOPMENT INC SAN JOSE, CALIFORNIA
APPROVALS	DATE	MODEL 100R-4 FINAL Q C TEST
DRAWN Lmm	6-26-84	
CHECKED		SCALE + SIZE A DRAWING NO. 79-7100-1804
ISSUE		DO NOT SCALE DRAWING SHEET 2 OF 4

21. Select fixed OSC FREQ-1004. Select CMSG filter. Meter should read +90. Check noise tracking. Requirements are as follows:

Attenuator Setting	Meter Displays
0.00	+90.0 dBrn
10.0	+80
20.0	+70
30.0	+60
40.0	+50
50.0	+40
60.0	+30
70.0	+20
80.0	+10 ±1
90.0	+0 ±3

22. With attenuator set at 90 select NOTCH (in). NOISE should read below +5 dBrn. Remove NOTCH (out).

23. Return attenuator to 00.0. On RCV select LEVEL (in). LEVEL should read 0.0 ±.1 dBm.

24. Switch RCV/SND/ to SEND (in). LEVEL should read 0.0 dBm ±.1.

25. Select N/G and CMSG (in). Noise should read +131 dBrn ±1. Select LEVEL (in) and set RCV/SEND to RCV (out).

26. Set OSC LEVEL at 0 and OSC FREQ at 1004 Hz. Increase speaker VOLUME control clockwise and listen for audible tone on speaker.

27. Remove any cords from unit and switch L/N/RL to RL (in).

28. Set RL controls (red marking) as follows: CIRCUIT TYPE to 2W, 600Ω, TEST to ERL, 4WTLP to 0/0 (out), 2W NET to INT (out).

29. Display should read 0.0 ±0.1 Check that RETURN LOSS dB panel LED is lit. If display does not read that, adjust LEVEL #3 on rear panel.

30. Plug 900Ω .1% terminated patch cord into SEND jack of unit.

31. On RCV IMPEDANCE select 900Ω, display should read 28.3 ±0.4. Select SRL-HI. Display should read 36.6 ±.04. Select SRL-LO display should read 18.9 ±0.4.

32. Disconnect terminated patch cord and connect patch cord between the RCV and SEND jacks.

33. Select 4W CIRCUIT TYPE and switch TEST to ERL. Display should read ±0.0 ±0.2.

34. With RCV/SEND select SEND (in). Display should read ±0.0 ±0.1. With RCV/SEND select RCV (out) and switch TEST to SRL-LO (in). Display should read ±0.0 ±0.3.

35. Select SRL-HI (in). Display should read ±0.0 ±0.2

36. Select 4WTLP -16, +7 (in). Display should read 23.0 ±0.2. Switch 4WTLP to 0/0 (out).

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± .005 ±		DESIGN DEVELOPMENT INC SAN JOSE, CALIFORNIA	
APPROVALS	DATE	MODEL 100R-4 FINAL Q C TEST	
DRAWN	6-26-84		
CHECKED		SCALE +	SIZE A
		DRAWING NO. 79-7100-1804	
ISSUE		DO NOT SCALE DRAWING	SHEET 3 OF 4

37. Patch an attenuator between SEND & RCV Jacks. Check Return loss tracking. Requirements are as follows:

Attenuator Setting:	THL CORRECT 4W	Meter Reading:
00.0	00.0	0.0 ±0.2
10.0	00.0	+10.0 to ±0.5
20.0	00.0	+20.o to ±0.5
30.0	00.0	+30.0 to ±0.5
40.0	00.0	+40.0 to ±0.5
50.0	00.0	+49.0 to + Blanking
60.0	10.0	+49.0 "
70.0	20.0	+49.0 to "

38. connect patch cords and reset THL CORRECT 4W to 00.0. On RCV IMPEDANCE select 600 Ω. On TEST select CSC (in). Display should read +0.0 ±0.2.

39. With RCV/SEND select SEND (in). Display should read +0.0 ±0.2.

40. To test Aisle Display position served indicator, see Table-1. Check per Table-1 for digits 2,6, and 8, observing the test 100A3 Aisle Display to show results.

TS 1 on R5 TMS

Strap Pin Numbers	Position Indicated
1,2,4,5	2
1,4,5	6
2,3,4,5	8

41. Final check:
a) Turn power switch off on rear panel.
b) Turn power off on power supply.
c) Remove power wires from both units.
d) Slightly tighten down screws on power block.
e) Do final cosmetic check.
f) Place terminal back cover on TS-1. Check all screws are in place. Clean unit when needed with cleanser, and use soft cloth wiper.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES FRACTIONS ± .005 ANGLES ±		DESIGN DEVELOPMENT INC SAN JOSE, CALIFORNIA
APPROVALS	DATE	MODEL 100R-4 FINAL Q.C TEST
[illegible]	6-26-84	
CHECKED		SCALE + SIZE A DRAWING NO. 79-7100-1804

DESIGN DEVELOPMENT, INC.

MODEL 100R-4 CALIBRATION PROCEDURES

1) INITIAL TURN ON
2) POWER SUPPLY CHECK
3) OSCILLATOR CAL
4) RETURN LOSS TRANSMITTER CAL.
5) RECEIVER LEVEL CAL
6) RECEIVER NOISE CAL
7) RECEIVER RETURN LOSS CAL.
8) MISCELLANEOUS CIRCUIT CHECK

TEST EQUIPMENT REQUIRED:-

1) OSCILLOSCOPE
2) DVOM
3) 600 OHM ATTENUATOR-BALANCE
4) TTS MODEL 100R4
5) 1 MILLIWAT REFERENCE GENERATOR
6) AC VOLT METER-HP MODEL 403B
7) DC POWER SUPPLY
8) 600 OHM RESISTOR, 0.1%
9) 900 OHM RESISTOR, 0.1%
10) 2.16 MF CAPACITOR, 1%

1.0) SECTION 1 - INITIAL TURN ON

1.1) VISUAL INSPECTION:-INSPECT THE UNIT CAREFULLY, CHECK IF ANY COMPONENTS ARE MISSING. SOLDER BRIDGES, CAPACITORS, DIODES, AND I.C.'S ARE LOADED IN THE RIGHT MANNNER.

1.2) SET DVOM TO RESISTANCE, CHECK ALL THE TIP TRANSISTORS AND VOLTAGE REGULATORS (ON TRANSMITTER BOARD) ARE NOT SHORTED TO THE HEAT-SINK.

1.3) MID-RANGE ALL POTS.

1.4) USING THE DVOM, CHECK ACROSS CAPACITORS C608, C606, AND C604. OBSERVE THAT THERE IS NO SHORT ACROSS ANY OF THEM.

2.0) SECTION 2 - INITIAL TURN ON.

2.1) USE POWER INPUT COMMON AS REFERENCE, MONITOR THE COLLECTOR OF Q605 WITH THE SCOPE. SET THE VERTICAL GAIN TO 20V/DIV, AND HORIZONTAL SWEEP TO 10 MS/DIV.

2.2) ADJUST DC POWER SUPPLY TO -48 VOLTS, AND CONNECT IT TO THE POWER INPUT OF THE UNIT UNDER TEST.

2.3) TURN POWER ON. OBSERVE THAT A CLEAN SQUARE WAVE OF 80 VOLTS PEAK TO PEAK APPEAR ON THE SCREEN, AND THE FREQUENCY IS AROUND 20K HZ. CHECK THE INPUT CURRENT SHOULD BE AROUND 280 MILLIAMPS. ADJUST THE VALUE OF R604, AND/OR R603 IF NECESSARY.

2.4) SET DVOM TO DC VOLTS, AND MONITOR ACROSS C608, CHECK THE VOLTAGE SHOULD READ -15V +/-.3V.

2.5) MONITOR ACROSS C606, THE VOLTAGE SHOULD READ +15V +/.3V.

2.6) MONITOR ACROSS C604, THE VOLTAGE SHOULD READ +5V +/-.2V.

3.0) SECTION 3 - OSCILLATOR CALIBRATION

3.1) PATCH THE 100R4 SEND TO THE TTS 100R4 RECEIVE AND SELECT SETTING AS FOLLOWS:

100R4 TRANSMITTER SWITCH
- a) NORM
- b) 600 OHM
- c) VAR-OSC LEVEL, AND
- d) VAR-OSC FREQUENCY (100HZ TO 4KHZ)

100R4 RECEIVER SWITCH
- a) 600 OHM
- b) TERM
- c) LEVEL

3.2) TURN POWER TO ON IN BOTH UNITS, AND ADJUST VAR FREQUENCY CONTROL IN THE FRONT PANEL ALL THE WAY COUNTER CLOCKWISE, ADJUST R352 TO READ 90 HZ ON THE TTS 100R4.

3.3) TURN THE VAR FREQUENCY CONTROL ALL THE WAY CLOCKWISE, THE FREQUENCY SHOULD READ ABOVE 4KHZ.

3.4) SELECT 404 ON THE 100R4, AND ADJUST R355 TO READ 404.

3.5) SELECT 1004 ON THE 100R4, AND ADJUST R357 TO READ 1004.

3.6) SELECT 2804 ON THE 100R4, AND ADJUST R358 TO READ 2804.

3.7) SELECT 1004, AND ADJUST VAR LEVEL SO THE METER READS 0.0 DBM. SELECT DBRN, C-MSG AND 1010 NOTCH FILTER ON THE 100R4, ADJUST R360 AND R359 TO READ BELOW +30 DBRN. CHECK 3KHZ AND 15KHZ TO READ BELOW 35 DBRN.

3.8) RECHECK STEPS 3.3 TO 3.6.

3.9) SELECT 1004 ON THE 100R4, AND ADJUST VAR LEVEL ALL THE WAY CLOCKWISE. ADJUST R391 TO READ 10.3 DBM. ADJUST VAR LEVEL ALL THE WAY COUNTERCLOCKWISE, THE LEVEL SHOULD READ BELOW -40.2 DBM.

3.10) SELECT 0 DBM, AND ADJUST R368 TO READ 0.0 DBM.

3.11) CHANGE FREQ TO VAR, AND 1004 HZ, ADJUST R375 TO READ 0.0 DBM ON THE METER.

3.12) SELECT -16 DBM, AND ADJUST R369 TO READ -16.0 DBM.

3.13) CHANGE LEVEL TO VAR, ADJUST IT TO READ 0.0., CHANGE VAR FREQ SETTING TO 4 KHZ TO 20 KHZ, ADJUST VAR FREQ CONTROL ALL THE WAY COUNTERCLOCKWISE, THE FREQUENCY SHOULD READ BELOW 4 KHZ, AND ALL THE WAY CLOCKWISE, THE FREQUENCY SHOULD READ ABOVE 22 KHZ. OBSERVE THAT THE LEVEL SHOULD NOT CHANGE MORE THAN 0.2 DBM, AND REPEAT THE STEP WITH THE VAR LEVEL SET AT +9.0 DBM, THE LEVEL SHOULD NOT CHANGE MORE THAN 0.2 DBM.

3.14) SELECT 0 DBM AND 1004, AND CHANGE TO 900 OHM ON BOTH 100R4 AND TTS 100R4 ADJUST R392 TO READ 0.0 DBM ON THE METER.

4.0) SECTION 4 - RETURN LOSS TRANSMITTER CAL.

4.1) LIFT UP THE + SIDE OF C301, USING A JUMPER AND CONNECT IT TO PIN 6 OF U310. SET UP THE EQUIPMENTS AS FOLLOWS:-

100R4 TRANSMITTER
- a) 600 OHM
- b) VAR LEVEL, AND
- c) VAR FREQ

100R4 RECEIVER
- a) 600 OHM
- b) TERM
- c) LEVEL

4.2) TURN POWER ON AND SELECT 4W, ERL, AND RL ON THE 100R4 RECEIVER. ADJUST VAR LEVEL AND FREQ TO READ 0.0 DBM AND 100 HZ, CHECK THE READING AGAINST THE TABLE BELOW:-

FREQ	READING	TOLERANCE
200	>-30	XXXXXXXXX
300	-21.8	+/-2.3
560	-3	0.6
750	-0.2	0.3
1000	0	0.1
1500	-0.1	0.3
1965	-3	0.6
2400	-10.9	1.2
3000	-22.9	3.0
4000	-42.6	5.0
>5000	>-45	XXXXXXXXX

4.3) SELECT SRL-LO, SET FREQ AND LEVEL TO READ 0.0 DBM AND 360 HZ, CHECK FILTER RESPONSE AGAINST THE TABLE BELOW:-

FREQ	LOSS	TOLERANCE
<100	>20	XXXXXXXXX
120	-20	XXXXXXXXX
200	-9.5	+/-1.1
260	-3	0.5
360	0	0.2
500	-3	0.5
650	-10	1.2
1000	-20	XXXXXXXXX
>1200	>20	XXXXXXXXX

4.4) SELECT SRL-HI, SET FREQ AND LEVEL TO READ 0.0 DBM AND 2750 HZ, CHECK FILTER RESPONSE AGAINST THE TABLE BELOW:-

FREQ	LOSS	TOLERANCE
>1000	>30	XXXXXXXXX
1300	-30	XXXXXXXXX
2000	-11.5	+/-1.3
2200	-3	0.5
2750	0	0.00
3400 *	-3	0.5
3700	-10.9	1.3
5700	-30	XXXXXXXXX
>6000	>30	XXXXXXXXX

*ADJUST R317 TO READ -3.0 DB

4.5) TURN OFF POWER AND SOLDER C301 BACK TO THE PC BOARD. PATCH THE 100R4SEND OUTPUT TO THE HP403 AC VOLTMETER, TERMINATE THE VOLTMETER WITH A 600 OHM, 1% RESISTOR. SELECT ERL FILTER, AND ADJUST R301 TO READ -2.0 DBM.

4.6) SELECT SRL-HI FILTER AND ADJUST R327 TO READ -2.0 DBM.

4.7) SELECT SRL-LO FILTER AND ADJUST R311 TO READ -2.0 DBM.

5.0) SECTION 5 - RECEIVER CALIBRATION-LEVEL

5.1) PATCH 100R4 RECEIVE TO 100R4 SEND, AND SETUP THE EQUIPMENTS AS FOLLOWS:-

100R4 RECEIVER
- a) 600 OHM
- b) TERM
- c) LEVEL, AND
- d) L/N

100R4 SEND
- a) 600 OHM
- b) 1004, AND
- c) VAR LEVEL

5.2) MONITOR ACROSS C31 WITH THE DVOM AND SET IT TO READ DCV. INCREASE THE 100R4 LEVEL OUTPUT TO APPROXIMATELY +3.5 DBM SO THAT THE DVOM READS 4.000 VOLTS. INTRODUCE 12 DB OF ATTENUATION, AND ADJUST R67 TO READ 1.004 VOLTS. REPEAT THE ABOVE STEP FOR PROPER TRACKING.

5.3) INCREASE LEVEL SO THE 100R4 DISPLAYS +4.0 DBM, INTRODUCE 13 DB OF ATTENUATION, ADJUST R81 TO READ +9.0. REPEAT THE PROCESS FOR PROPER TRACKING. CHECK TRACKING ALL THE WAY TO -50.0, OBSERVE THAT THE DISPLAY WILL BLANK BELOW -50.0 DBM EXCEPT THE MINUS SIGN, AND WILL BLANK ABOVE +15.0 DBM EXCEPT THE PLUS SIGN.

5.4) PATCH THE REFERENCE GENERATOR (600 OHM) TO THE RECEIVE INPUT OF THE 100R4, ADJUST R7 TO READ 0.0. SWITCH BOTH 100R4 AND REFERENCE GENERATOR TO 900 OHM, AND ADJUST R8 TO READ 0.0 DBM.

5.5) PATCH THE 100R4 SEND TO THE 100R4 RECEIVE INPUT, AND ADJUST 100R4 TO SEND 0.0 DBM AT 1004 HZ TO THE 100R4, SLOWLY SWEEP THE SEND FREQUENCY FROM 100 HZ TO 20 KHZ, CHECK THAT THE 100R4 SHOULD READ WITHIN +/-0.2 DB.
*SELECT A CAPACITOR ACROSS R33 OR R34 IF NECESSARY.

5.6) SET THE METER TO READ 0.0 DBM, AND 1004. SELECT BP (0.2-5 KHZ), ADJUST R248 TO READ 0.0. CHECK THE -3DB POINT AT 200 HZ AND 5 KHZ.

5.7) SLOWLY SWEEP THE FREQUENCY TO 10 KHZ, OBSERVE THE FREQUENCY DECIMAL WILL CHANGE TO 10 HZ RESOLUTION AS THE FREQUENCY EXCEED 10 KHZ. SLOWLY DECREASE THE SEND FREQUENCY, OBSERVE THAT THE DECIMAL WILL CHANGE BACK TO 1 HZ RESOLUTION BELOW 9.000 KHZ.

6.0) SECTION 6 - RECEIVER NOISE CALIBRATION.

6.1) PATCH THE 100R4 SEND TO THE 100R4 RECEIVE INPUT. AND SETUP EQUIPMENTS AS FOLLOWS:-

100R4 SEND
- a) 600 OHM
- b) VAR LEVEL, AND
- c) VAR FREQ

100R4 RECEIVE
- a) 600 OHM
- b) TERM, AND
- c) C-MSG FILTER

6.2) SET 100R4 SEND TO -0.4, AND 1004 HZ. ADJUST R35 SO THE READING OF THE METER JUST CHANGE FROM +89 TO +90 DBRN. SET LEVEL TO 0.0 DBM, AND CHECK THE FILTER FREQUENCY RESPONSE AGAINST THE TABLE BELOW:-

FREQ	READING	TOLERANCE
200	+65	+/-2
400	+79	1
700	+87	1
1000	+90	0
1500	+89	1
2800	+88	1
3500	+82	2
5000	+61	3

6.3) SELECT 3KHZ FILTER, AND 15 KHZ FILTER AND CHECK THEM AGAINST THE TABLE BELOW:-

3KHZ FILTER

FREQ	READING	TOLERANCE
400	+90	+/-1
1000	+90	0
3000	+87	1

15KHZ FILTER

FREQ	READING	TOLERANCE
400	+90	+/-1
1000	+90	0
3000	+90	1
15000	+87	1

6.4) SET FREQUENCY TO 1004, AND SELECT C-MSG FILTER, CHECK TRACKING TO 0 DBRN, ADJUST R23 IF NECESSARY TO READ PROPER WHEN BELOW +10 DBRN. CHECK TO SEE THAT WHEN BELOW +0 DBRN THE DISPLAY WILL BLANK EXCEPT THE MINUS SIGN, AND WHEN ABOVE +95, THE DISPLAY WILL BLANK EXCEPT THE PLUS SIGN

6.5) SET UP THE EQUIPMENT AS FOLLOWS:-

100R4 SEND
- a) 600 OHM
- b) 0 DBM, AND
- c) 1004

100R4 RECEIVE
- a) 600 OHM
- b) TERM
- c) 3KHZ FILTER, AND
- d) NOTCH

6.6) ADJUST R217 AND R228 TO OBTAIN THE LOWEST READING (BELOW +30 DBRN). CHANGE FREQUENCY TO 404 HZ, ADJUST R211 TO READ +90 DBRN.

6.7) INCREASE FREQUENCY TO 862 HZ, ADJUST R205 TO READ +87 OR +88 DBRN.

6.8) INCREASE FREQUENCY TO 1182 HZ, ADJUST R239 TO READ +87 OR +88 DBRN.REPEAT STEPS 6.7 AND 6.8 FOR PROPER READINGS.

6.9) CONNECT THE TIP OUTPUT OF THE 100R4 SEND TO PIN 8 OF THE TS-1 CONNECTOR OF THE 100R4, AND THE RING OUTPUT TO BOTH THE TIP AND RING RECEIVE INPUT OF THE 100R4. ADJUST SEND LEVEL TO 0.0 DBM AND 1004 HZ, SELECT C-MSG AND NOISE N/G (NO 1010 HZ NOTCH FILTER). THE METER SHOULD READ +90. DECREASE LEVEL TO -40 DBM, THE METER SHOULD READ +50. INCREASE THE LEVEL TO +15 DBM, THE METER SHOULD READ +105.

6.10) USE A JUMPER, SHORT PIN 11 OF U28 TO GROUND. CHECK THAT THE FREQUENCY READOUT WILL DISPLAY THE PROPER FREQUENCY.

7.0) SECTION 7 - RECEIVER RETURN LOSS CALIBRATION

7.1) SETUP 100R4 AS FOLLOWS:-

- a) 900 OHM,
- b) 2W,
- c) ERL
- d) INT NET, AND
- e) RL

MONITOR PIN 6 OF U15 WITH THE SCOPE, AND CONNECT A 900 OHM, 0.1% RESISTOR, AND A 2.16 MF CAPACITOR IN SERIES ACROSS THE OUTPUT OF THE SEND. ADJUST THE RESISTOR R507 TO OBTAIN THE LOWEST READING ON THE SCOPE.

7.2) SWITCH TO 600 OHM, AND REMOVE THE RESISTOR/CAPACITOR NETWORK. ADJUST R41 SO THE METER JUST STARTS TO CHANGE FROM -0 TO +0. SHORT THE SEND OUTPUT WITH A JUMPER THE METER SHOULD STILL READ 0.

7.3) SWITCH BACK TO 900 OHM, AND CONNECT A 900 OHM, 0.1% RESISTOR ACROSS THE SEND OUTPUT. THE METER SHOULD READ +28.3 ± 0.4 DB. SWITCH TO SRL-LO, THE METER SHOULD READ +18.9 ± 0.4 DB. SWITCH TO SRL-HI, THE METER SHOULD READ +36.6 ± 0.4 DB.

7.4) PATCH THE SEND AND THE RECEIVE TOGETHER THRU AN ATTENUATOR. SELECT 4W, ERL AND MAKE SURE THE THL CORRECTION IS SET TO 00.0 ADJUST R44 TO READ +/-0.

7.5) USE THE ATTENUATOR, CHECK TRACKING TO +50 DB. SET THL CORRECTION TO 10.0, CHECK THE READING TO BE +40. REPEAT THAT PROCESS FOR THE 1 DB AND 0.1 DB DIGIT, CHECK THEM FOR PROPER OPERATION, WITH THE THL CORRECTION SET AT 29.9 THE DISPLAY SHOULD READ +20. INCRASE THE ATTENUATOR SETTING TO ANOTHER 30 DB, THE METER SHOULD NOW READ +50. THE SET WILL BLANK AT +51.

7.6) RESET ALL BACK TO 0. SELECT -16/+7 SWITCH, CHECK THE METER TO READ +23.0 DB ± 0.2 DB.

8.0) SECTION 8 - MISCELLANEOUS CIRCUIT CHECKS.

8.1) SELECT 600 OHM, 0 DBM, AND 1004 ON THE SEND, AND 600 OHM, TERM, AND LEVEL ON THE RECEIVE SELECT DISP, AND ADJUST R395 (TRANSMITTER BOARD) TO READ 0.0.

8.2) SELECT RL, 4W AND ADJUST R398 TO READ 0. SWITCH TO OSC AND ADJUST R386 TO READ 0.

8.3) SELECT NORM/XFR SWITCH, CHECK NOW THE SEND BECOMES REC, AND THE REC BECOMES SEND.

8.4) SET THE DVOM TO MILLIAMP DC, AND CONNECT IT IN SERIES WITH THE 600 OHM RESISTOR, SEND OUTPUT AND THE -48 VOLT POWER SUPPLY. SELECT HOLD SWITCH, OBSERVE THE DVOM SHOULD READ AROUND 25 MA. REPEAT THE SAME STEP FOR THE RECEIVE INPUT.

8.5) SELECT S/R DIAL. USING THE DVOM, CHECK THAT THE RECEIVE TIP AND RING SHOULD CONNECT TO THE TIP AND RING OF THE DIAL OUTPUT.

8.6) CONNECT 100A-3 TO PINS 6 AND 7 OF TS-1 CONNECTOR, CHECK THE SERIAL DISPLAY FOR PROPER OPERATION. ALSO CHECK POSITION SERVE STRAPPING OPTION.

8.7) SEAL ALL POTS.

MODEL 100R4 PARTS LIST (7100-1804)

REFERENCE DES.	DDI PART#	DESCRIPTION	QUANTITY
-	0001	REV #1	1
-	2000-1505	ELEC,MISC,KNOBS	2
-	2000-1554	ELEC,MISC,BLK BUTTON PB12	26
-	2001-1001	HWD,10-32 X 5/16	4
-	2002-1004	HWD,6-32 X 5/16	2
-	2002-1005	HWD,6-32 X 5/16	3
-	2002-1006	HWD,6-32 X 5/16	7
-	2002-1010	HWD,6-32 X 7/16	2
-	3003-1001	SM,TOP COVER,100R SERIES	1
-	3004-1032	SM,MISC,100A SERIES BACK	1
-	3004-1039	SM,MISC,RACKEARS (BLK ANO	2
-	6100-1804	ASY,FINAL,100R-4	1

100R4 FINAL PCB PARTS LIST (6100-1804)

REFERENCE DES.	DDI PART#	DESCRIPTION	QUANTITY
	0001	REV #1	1
-	6700-1026	ASY,FP,100R-4	1
-	6710-1002	ASY,RP,100R-4,5,6,2W	1
-			

100R4 FRONT PANEL PARTS LIST (6700-1026)

REFERENCE DES.	DDI PART#	DESCRIPTION	QUANTITY
-	0006	REV #6	1
-	2000-1008	ELEC,SW,THUMBWHEEL,LB731D	1
-	2000-1009	ELEC,SW,THUMBWHEEL,LB731	1
-	3004-1062	SM,MISC,120R & 100R4,5,6	1
-	3000-1026	SM,FP,100R-4	1
-	3900-1720	MOD,STK,27	1
-	3900-1721	MOD,STK,22	1
-	2002-1005	HWD,6-32 X 5/16	8
-	2006-1000	HWD,6-32 X 5/16	6
-	2013-1000	HWD,5/8 X 5/8	3
-	2011-1003	HWD,6-32 X 3/8	2
-	2003-1003	HWD,4-40 X 1/4	1
-	3005-1065	FAB,PLST,THUMBWHEEL BRKT.	1
-	6740-1011	ASY,PCB,100R-4 DISPLAY	1
-	6740-1010	ASY,PCB,100R-4 R/L OSCILL	1
-	6740-1009	ASY,PCB,100R-4 MAIN	1
-	2004-1001	HWD,2-56 X 1 1/8	2
-	2008-1000	HWD,2-56 X 3/16	4
-	3004-1035	SM,MISC,PC BOARD SPACER	4
-	2010-1002	HWD,3/8 X 5/8	2
-	3900-1731	MOD,STK,31	1
-	3900-1752	CABLE, FLAT RIBBON,4 COND	1
-	3900-1753	CABLE, FLAT RIBBON,4 COND	1
-	3900-1754	CABLE, FLAT RIBBON,3 COND	1
-	2000-1500	ELEC,MISC,SM TIE WRAP	4
C500	1058-2161	CAP,PYCA,2.164 UF,1%	1
R346,370	1007-1002	RES,POT,1/4W,10 K,10T	2
R507	1003-1004	RES,POT,1/2W,1 M,1T	1
S3	2000-1006	ELEC,SW,THUMBWHEEL,LB731/	1

100R4/R5 DISPLAY PARTS LIST (6740-1011)

REFERENCE DES.	DDI PART#	DESCRIPTION	QUANTITY
	0002	REV #2	1
-	1054-0010	CAP,CER,.01UF,100V	1
C1	2000-1002	ELEC,SW,SGL POST	1
-	2000-1401	ELEC,MISC,FUSE HOLDER	1
-	2000-1403	ELEC,MISC,1/2AMP FAST-BLO	1
-	2000-1507	ELEC,MISC,POWER BLOCK	1
-	2000-1510	ELEC,MISC,CONNECTOR 30PIN	1
-	2000-1523	ELEC,MISC,SHRINK SLEEVE M	0.5
-	2002-1001	HWD,6-32 X 5/8	1
-	2002-1002	HWD,4-40 X 1/2	2
-	2002-1005	HWD,6-32 X 5/16	3
-	2002-1008	HWD,6-32 X 3/16	3
-	2002-1011	HWD,6-32 X 1/2	1
-	2002-1101	HWD,3/16 X .018 X #6,LUG	1
-	2006-1000	HWD,6-32 X 5/16	1
-	2007-1001	HWD,4-40 X 1/4	2
-	2011-1000	HWD,6-32 X 1 1/8	2
-	3001-1002	SM,RP,100R4,5,6,2W	1
-	3002-1001	SM,CH,100R SERIES	1
-	3004-1068	SM,MISC,CARD GUIDE 1 5/8	2

100R4 R/L OSCILL PARTS LIST (6740-1010)

REFERENCE DES.	DDI PART#	DESCRIPTION	QUANTITY
-	0006	REV #6	1
-	2003-1000	HWD,4-40 X 3/4	1
-	2007-1001	HWD,4-40 X 1/4	7
-	2012-1000	HWD,4 X 1/16	8
-	2000-1546	ELEC,MISC,MICA INSULATOR	12
-	2003-1001	HWD,4-40 X 3/8	6
-	3400-1010	PCB,100R-4 RETURN LOSS OS	1
-	2010-3757	HWD,WHITE NYLON FLAT WASH	1
C202	1052-0010	CAP,TANT,1UF,35V	1
C301	1050-3900	CAP,MICA,390 PF,5%	1
C302	1050-2000	CAP,MICA,200 PF,5%	1
C303,304,305,306,308	1058-0100	CAP,PYCA,.01UF,1% 200V	5
C307,333	1059-0104	CAP,PYCA,.1UF,50V	2
C309,310,311,312,313	1058-0100	CAP,PYCA,.01UF,1% 200V	5
C314,315,316,317,318	1058-0100	CAP,PYCA,.01UF,1% 200V	5
C319,320,322,325,340	1058-0100	CAP,PYCA,.01UF,1% 200V	5
C321,324,326,328	1051-1001	CAP,MICA,1000 PF,1%	4
C323,327,332	1058-0200	CAP,PYCA,.02UF,2%	3
C329,352,353,606,609	1052-0472	CAP,TANT,47UF,25V	5
C330,334,338	1052-0100	CAP,TANT,10UF,25V	3
C331,336,337	1052-0100	CAP,TANT,10UF,25V	3
C341	1058-4701	CAP,PYCA,.0047UF,1%,500V	1
C342	1050-0510	CAP,MICA,5%,51 PF	1
C345	1050-0100	CAP,MICA,10 PF,5%	1
C346	1059-1568	CAP,NPLPL,20UF,300V	1
C351,339	1050-0300	CAP,MICA,30 PF,5%	2
C355	1054-0010	CAP,CER,.01UF,100V	1
C356,201	1050-1000	CAP,MICA,100 PF,5%	2
C37,47	1053-0047	CAP,ELEC,470UF,16V	2
C45,343,344,349,350	1054-0100	CAP,MONOLYTH,0.1UF,12V	5
C46	1052-0001	CAP,TANT,.1UF,35V	1
C503,504,300	1052-0100	CAP,TANT,10UF,25V	3
C601,602	1053-0220	CAP,ELEC,22UF,63V	2
C603	1058-2001	CAP,PYST,2000 PF	1
C604,605,607,608	1052-0100	CAP,TANT,10UF,25V	4
CR201,202	1082-0754	SEMI,DIOD,1N754A,ZENER,6.	2
CR300,301,302,303,305	1080-4446	SEMI,DIOD,1N4446	5
CR504,505,506,507	1081-4004	SEMI,DIOD,1N4004	4
CR601,500,501,502,503	1081-4004	SEMI,DIOD,1N4004	5
CR602	1082-5260	SEMI,DIOD,1N5260,ZENER,43	1
CR603,604	1080-4446	SEMI,DIOD,1N4446	2
CR605,606,607,612,610	1080-4150	SEMI,DIOD,1N4150	5
CR611,613,614,615,616	1080-4150	SEMI,DIOD,1N4150	5
HS1	3004-1067	SM,MISC,100R HEATSINK	1
HS500,503	2000-1542	ELEC,MISC,HEATSINK (FAN T	2
Q300	1094-5245	SEMI,TRAN,2N5245	1
Q500,501,503,504	1090-3440	SEMI,TRAN,2N3440	4
Q502,505,201	1090-3565	SEMI,TRAN,2N3565	3
Q602,601	1093-0030	SEMI,TRAN,30A,TIP	2
Q603	1091-4249	SEMI,TRAN,2N4249	1

100R4 R/L OSCILL PARTS LIST (6740-1010)

REFERENCE DES.	DDI PART#	DESCRIPTION	QUANTITY
Q604,605	1092-0031	SEMI,TRAN,31B,TIP	2
R201	1001-2000	RES,1%,1/4W,200 OHM	1
R204	1001-4992	RES,1%,1/4W,49.9 K	1
R300	1001-1303	RES,1%,1/4W,130 K	1
R301	1004-5002	RES,POT,3/4W,50 K,15T	1
R302,361,362,363,389	1001-2002	RES,1%,1/4W,20 K	5
R303,304,306,307	1001-4322	RES,1%,1/4W,43.2 K	4
R305,308	1001-8662	RES,1%,1/4W,86.6 K	2
R309	1001-1472	RES,1%,1/4W,14.7 K	1
R311	1003-5001	RES,POT,1/2W,5 K,1T	1
R312	1001-6981	RES,1%,1/4W,6.98 K	1
R313,325,397,364,372	1001-1002	RES,1%,1/4W,10 K	5
R314	1001-3652	RES,1%,1/4W,36.5 K	1
R315	1001-7322	RES,1%,1/4W,73.2 K	1
R316,393,385	1001-3010	RES,1%,1/4W,301 OHM	3
R317	1003-0200	RES,POT,1/2W,20 OHM,1T	1
R318	1001-5362	RES,1%,1/4W,53.6 K	1
R320	1001-4870	RES,1%,1/4W,487 OHM	1
R321	1001-1073	RES,1%,1/4W,107 K	1
R322	1001-2432	RES,1%,1/4W,24.3 K	1
R323	1001-4872	RES,1%,1/4W,48.7 K	1
R324	1001-6980	RES,1%,1/4W,698 OHM	1
R326	1001-1103	RES,1%,1/4W,110 K	1
R327,386,395	1003-2002	RES,POT,1/2W,20 K,1T	3
R328	1001-1742	RES,1%,1/4W,17.4 K	1
R329	1001-4642	RES,1%,1/4W,46.4 K	1
R330	1001-6811	RES,1%,1/4W,6.81 K	1
R331,338,339,345,366	1001-1103	RES,1%,1/4W,110 K	5
R332,333	1001-1333	RES,1%,1/4W,133 K	2
R334	1001-4421	RES,1%,1/4W,4.42 K	1
R335,336	1001-1372	RES,1%,1/4W,13.7 K	2
R337,373,374	1001-2372	RES,1%,1/4W,23.7 K	3
R340	1001-3651	RES,1%,1/4W,3.65 K	1
R341,342	1001-1052	RES,1%,1/4W,10.5 K	2
R343,310	1001-1962	RES,1%,1/4W,19.6 K	2
R344,348	1001-3832	RES,1%,1/4W,38.3 K	2
R347,349	1001-5111	RES,1%,1/4W,5.11 K	2
R350	1001-1871	RES,1%,1/4W,1.87 K	1
R351	1001-5902	RES,1%,1/4W,59 K	1
R352,359,203	1003-5002	RES,POT,1/2W,50 K,1T	3
R353	1001-2371	RES,1%,1/4W,2.37 K	1
R354	1001-1502	RES,1%,1/4W,15 K	1
R355	1004-5001	RES,POT,3/4W,5 K,15T	1
R356	1001-4641	RES,1%,1/4W,4.64 K	1
R357	1004-2001	RES,POT,3/4W,2 K,15T	1
R358	1004-1001	RES,POT,3/4W,1 K,15T	1
R360,375	1003-1001	RES,POT,1/2W,1 K,1T	2
R365	1001-4993	RES,1%,1/4W,499 K	1
R367,371	1001-3740	RES,1%,1/4W,374 OHM	2
R368,369	1004-1002	RES,POT,3/4W,10 K,15T	2

100R4 R/L OSCILL PARTS LIST (6740-1010)

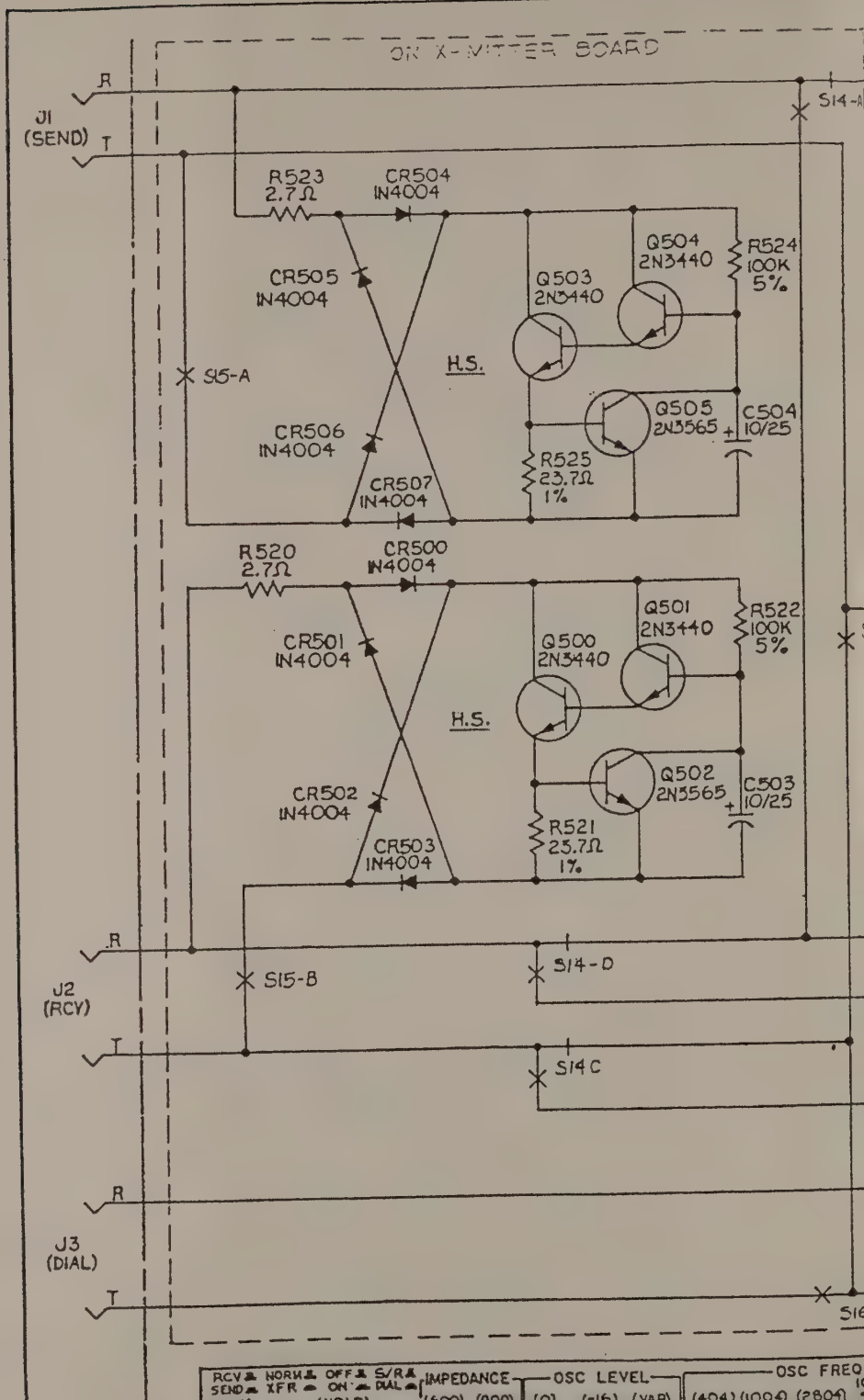
REFERENCE DES.	DDI PART#	DESCRIPTION	QUANTITY
R376	1001-1001	RES,1%,1/4W,1 K	1
R377,378,601	1000-1002	RES,5%,1/4W,10 K	3
R379	1001-3012	RES,1%,1/4W,30.1 K	1
R382	1001-2151	RES,1%,1/4W,2.15 K	1
R383,232	1001-1501	RES,1%,1/4W,1.5 K	2
R384	1001-221(	RES,1%,1/4W,221 OHM	1
R387,388,394,202	1001-100?	RES,1%,1/4W,10 K	4
R390	1001-1621	RES,1%,1/4W,1.62 K	1
R391	1003-5000	RES,POT,1/2W,500 OHM,1T	1
R396	1001-5360	RES,1%,1/4W,536 OHM	1
R398,392	1003-100?	RES,POT,1/2W,10 K,1T	2
R400,399,380,381,401	1000-1002	RES,5%,1/4W,10 K	5
R402,406,605	1000-1002	RES,5%,1/4W,10 K	3
R403	1001-3742	RES,1%,1/4W,37.4 K	1
R404,405	1001-2742	RES,1%,1/4W,27.4 K	2
R502,503	1000-0000	RES,1/4W,0.0 OHM	2
R520,523	1000-02R7	RES,5%,1/4W,2.7 OHM	2
R521,525	1001-23R7	RES,1%,1/4W,23.7 OHM	2
R522,524	1000-1003	RES,5%,1/4W,100 K	2
R602	1010-01R5	RES,5%,1/2W,1.5 OHM	1
R87	1000-0180	RES,5%,1/4W,18 OHMS	1
R88,89	1000-0100	RES,5%,1/4W,10 OHMS	2
RN501	1014-1002	RES,NETWORK,10 K,8-PIN	1
S2	3700-1117	SW,100R-4 OSCILLATOR	1
T300	3600-1000	XFMR,IN/OUT D14934	1
T601	3600-1001	XFMR,100R DC/DC	1
U200	1110-0308	SEMI,IC,LM308N	1
U300	1111-5837	SEMI,IC,LM5837N	1
U301,308,311	1110-0301	SEMI,IC,LM301AN	3
U302,303,304	1110-4136	SEMI,IC,4136	3
U305	1110-1458	SEMI,IC,1458	1
U306	1112-2206	SEMI,IC,2206CP	1
U307,309	1120-0082	SEMI,IC,082CP	2
U310	1110-0356	SEMI,IC,356	1
U312,313	1112-4052	SEMI,IC,CD4052BE	2
U314	1110-0386	SEMI,IC,LM386N-3	1
VR601	1102-7805	SEMI,IC,7805 HIGH,VOLT RE	1
VR602	1100-7815	SEMI,IC,78M15,VOLT REG	1
VR603	1101-7915	SEMI,IC,79M15,VOLT REG	1

100R5/R4/P4 MAIN PCB PARTS LIST (6740-1009)

REFERENCE DES.	DDI PART#	DESCRIPTION	QUANTITY
-	0002	REV #2	1
C1	1054-0010	CAP,CER,.01UF,100V	1
-	2000-1002	ELEC,SW,SGL POST	1
-	2000-1401	ELEC,MISC,FUSE HOLDER	1
-	2000-1403	ELEC,MISC,1/2AMP FAST-BLO	1
-	2000-1507	ELEC,MISC,POWER BLOCK	1
-	2000-1510	ELEC,MISC,CONNECTOR 30PIN	1
-	2000-1523	ELEC,MISC,SHRINK SLEEVE M	0.5
-	2002-1001	HWD,6-32 X 5/8	1
-	2002-1002	HWD,4-40 X 1/2	2
-	2002-1005	HWD,6-32 X 5/16	3
-	2002-1008	HWD,6-32 X 3/16	3
-	2002-1011	HWD,6-32 X 1/2	1
-	2002-1101	HWD,3/16 X .018 X #6,LUG	1
-	2006-1000	HWD,6-32 X 5/16	1
-	2007-1001	HWD,4-40 X 1/4	2
-	2011-1000	HWD,6-32 X 1 1/8	2
-	3001-1002	SM,RP,100R4,5,6,2W	1
-	3002-1001	SM,CH,100R SERIES	1
-	3004-1068	SM,MISC,CARD GUIDE 1 5/8	2

100R5,R4 REAR PANEL PARTS LIST (6710-1002)

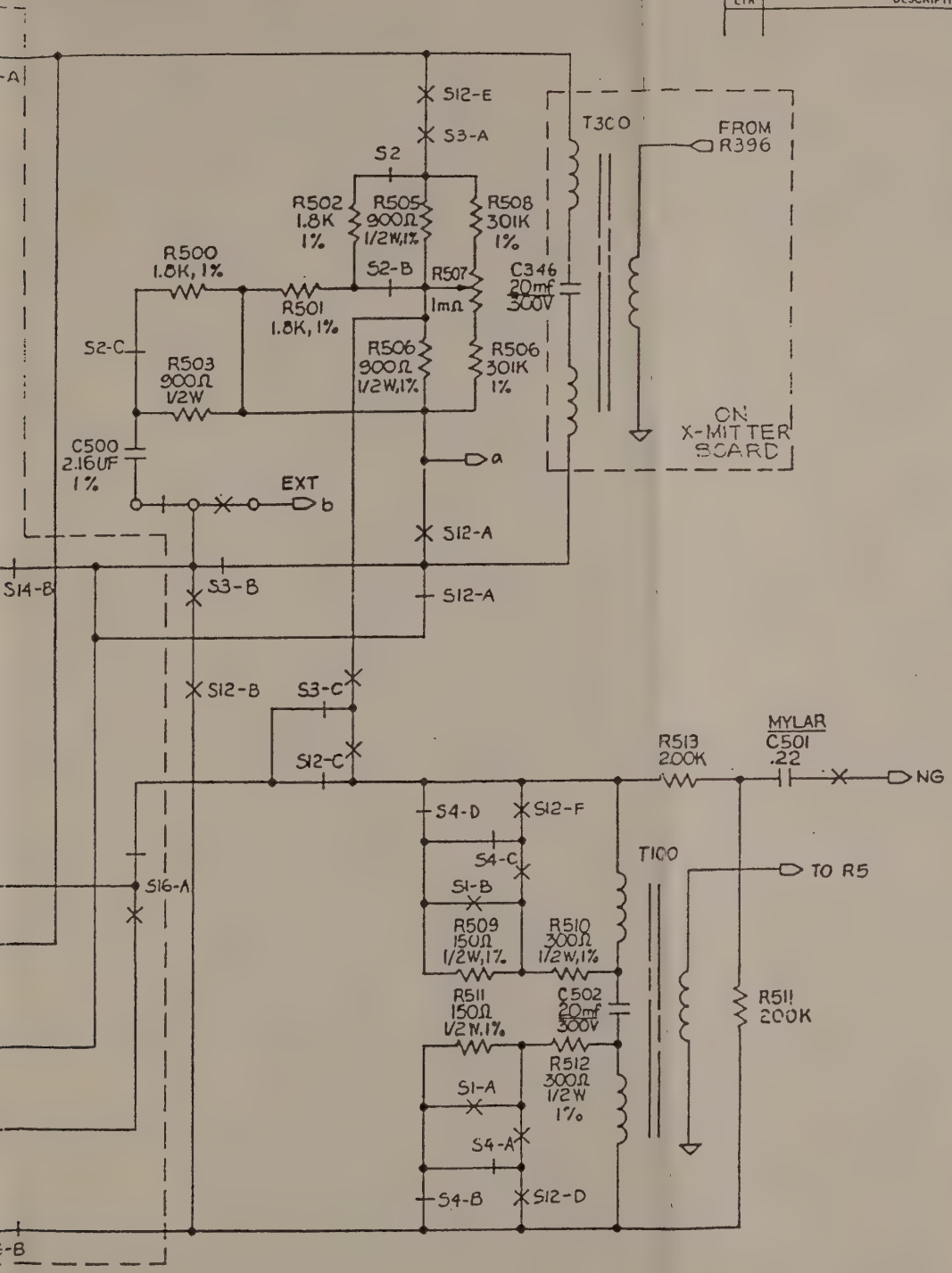
REFERENCE DES.	DDI PART#	DESCRIPTION	QUANTITY
-	0002	REV #2	1
C1	1054-0010	CAP,CER,.01UF,100V	1
-	2000-1002	ELEC,SW,SGL POST	1
-	2000-1401	ELEC,MISC,FUSE HOLDER	1
-	2000-1403	ELEC,MISC,1/2AMP FAST-BLO	1
-	2000-1507	ELEC,MISC,POWER BLOCK	1
-	2000-1510	ELEC,MISC,CONNECTOR 30'IN	1
-	2000-1523	ELEC,MISC,SHRINK SLEEVE M	0.5
-	2002-1001	HWD,6-32 X 5/8	1
-	2002-1002	HWD,4-40 X 1/2	2
-	2002-1005	HWD,6-32 X 5/16	3
-	2002-1008	HWD,6-32 X 3/16	3
-	2002-1011	HWD,6-32 X 1/2	1
-	2002-1101	HWD,3/16 X .018 X #6,LUG	1
-	2006-1000	HWD,6-32 X 5/16	1
-	2007-1001	HWD,4-40 X 1/4	2
-	2011-1000	HWD,6-32 X 1 1/8	2
-	3001-1002	SM,RP,100R4,5,6,2W	1
-	3002-1001	SM,CH,100R SERIES	1
-	3004-1068	SM,MISC,CARD GUIDE 1 5/8	2



FRONT PANEL SWITCHING

NOTE: MAIN CKT. IS ON MOTHER BOARD, PARTIAL IS O

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

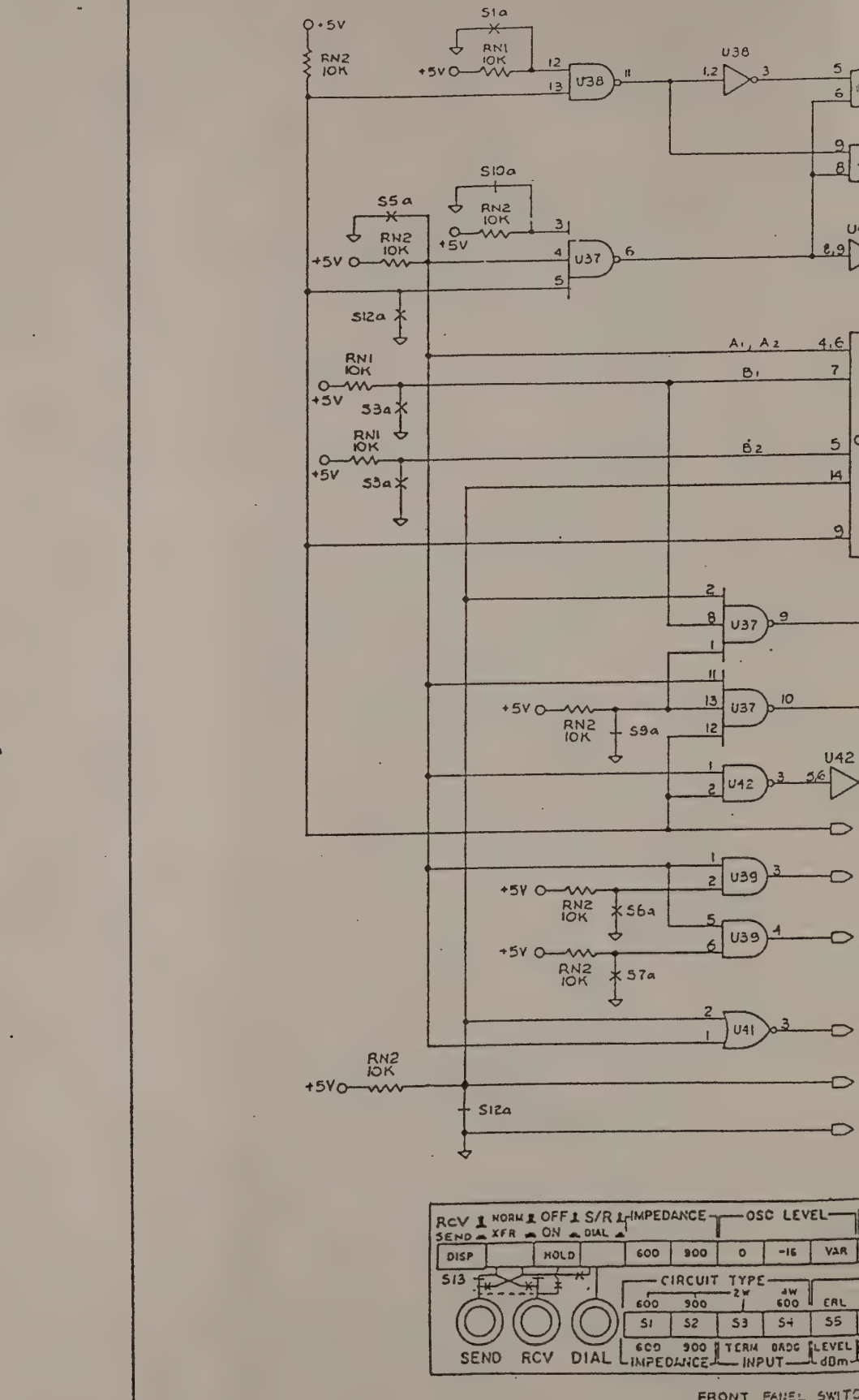


S25 S26

WTLP 2W NET 0.2-
INT 5KHZ
EXT (BP)
L/N
S9 S10 S11 S12
NOISE OUT
N/G IN
RL

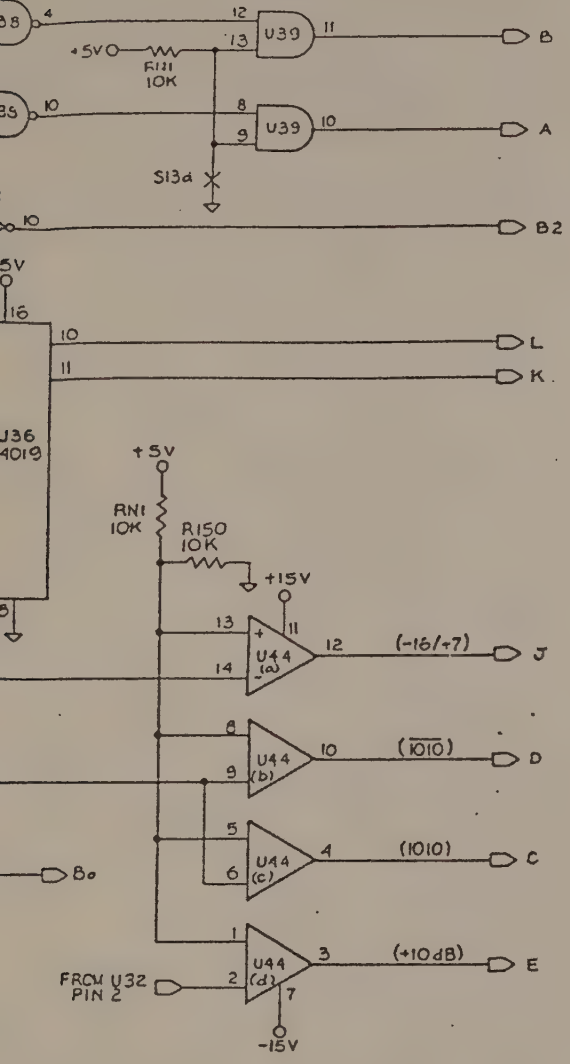
N X-MITTER BOARD.

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± — ± — ± —	DESIGN DEVELOPMENT INC.		
APPROVALS	DATE	SCHEMATIC DIAGRAM 100R-4 FRONT. SWITCH. CKT.	
DRAWN CP	1/18/82		
CHECKED	6/8	SCALE NONE	SIZE C
		DRAWING NO. EC-6740-1009	
		DO NOT SCALE DRAWING	SHEET 2 OF 6

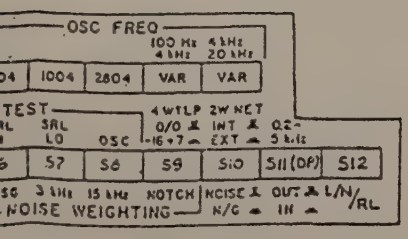


FRONT PANEL SWITC

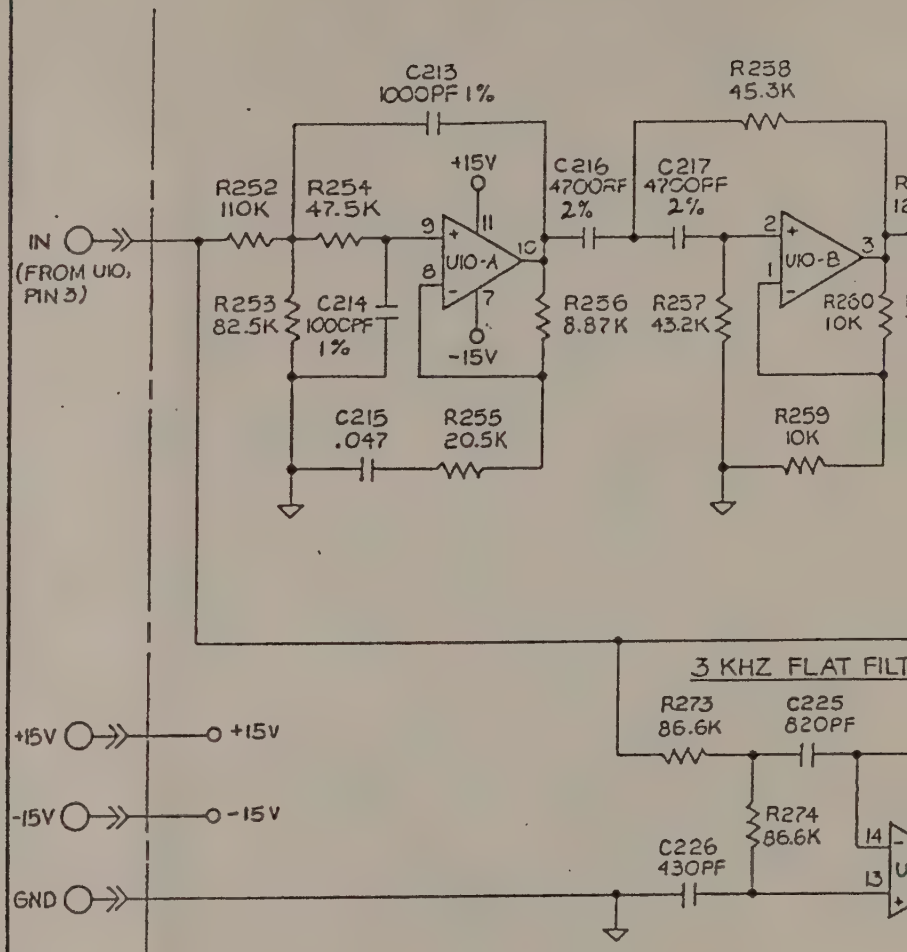
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVE



TO U313
ANS. BOARD

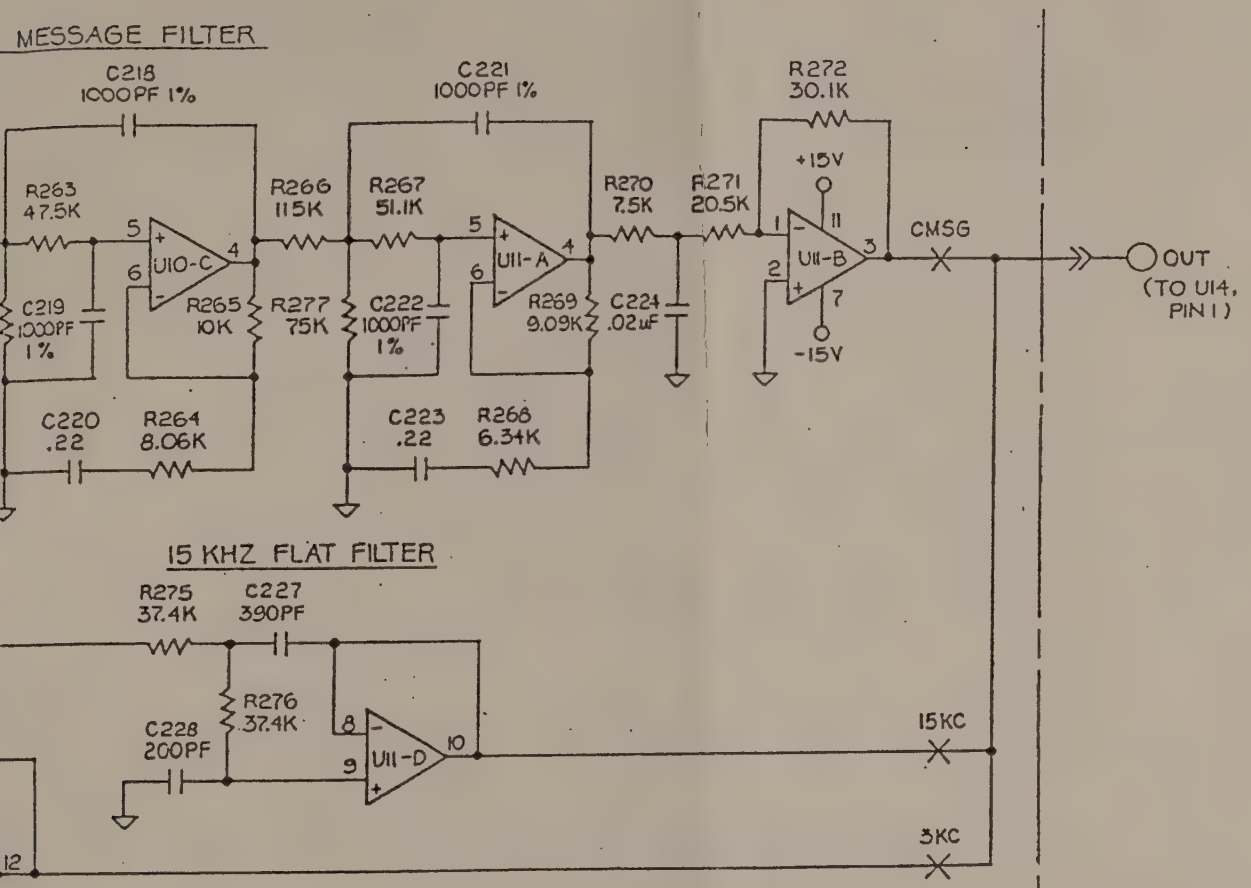


TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES = — ± — = —		DESIGN DEVELOPMENT INC. SUNNYVALE, CALIFORNIA	
APPROVALS	DATE	SCHEMATIC DIAGRAM 100R-4, CONTROL LOGIC CKT.	
DRAWN CP	3/1/62		
CHECKED		SCALE NONE	SIZE C
		DRAWING NO. 50-6740-1009	
		DO NOT SCALE DRAWING	SHEET 3 OF 6



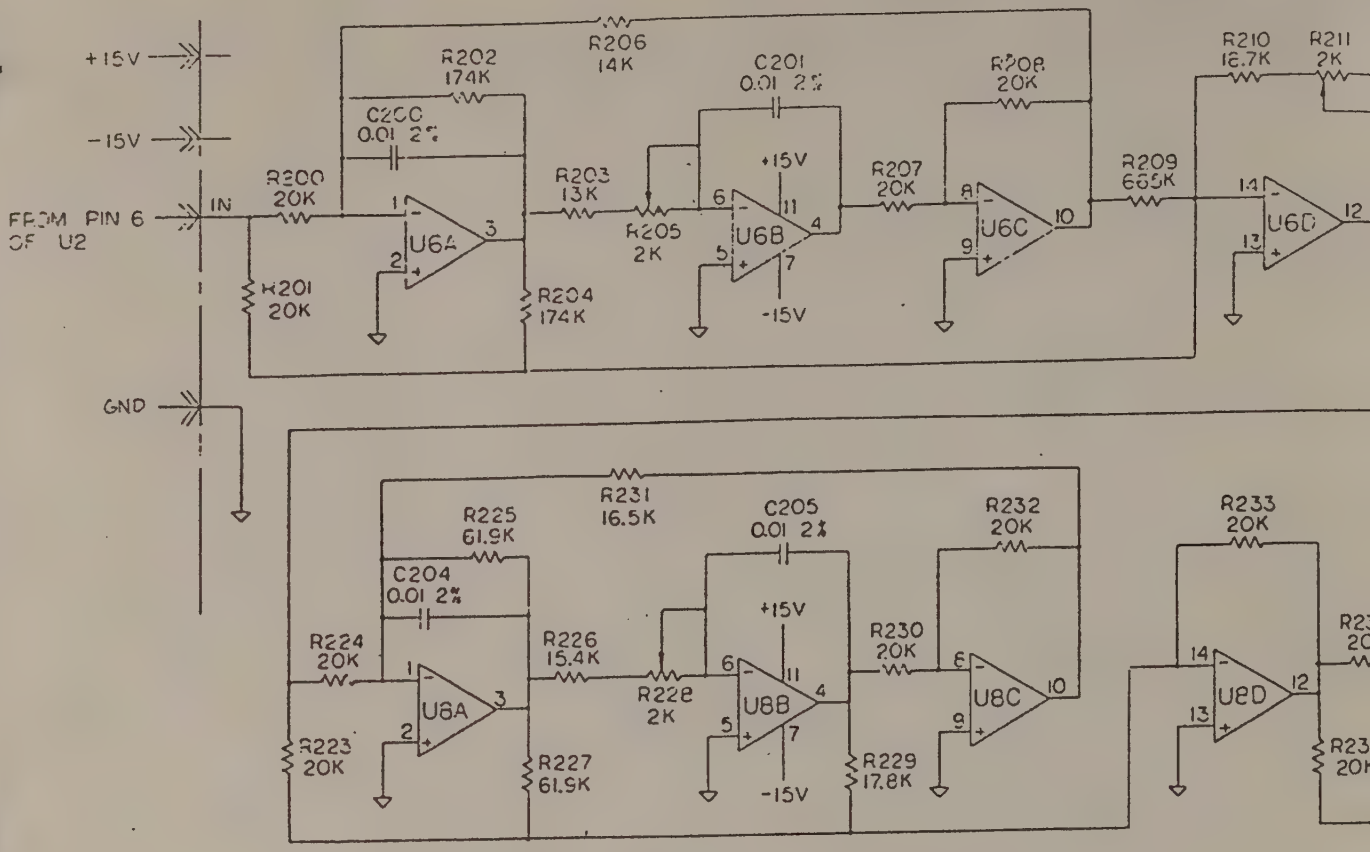
NOTES: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS ARE M.F. (METAL FILM) 1%.
2. ALL OPERATIONAL AMPLIFIERS ARE RC4136.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

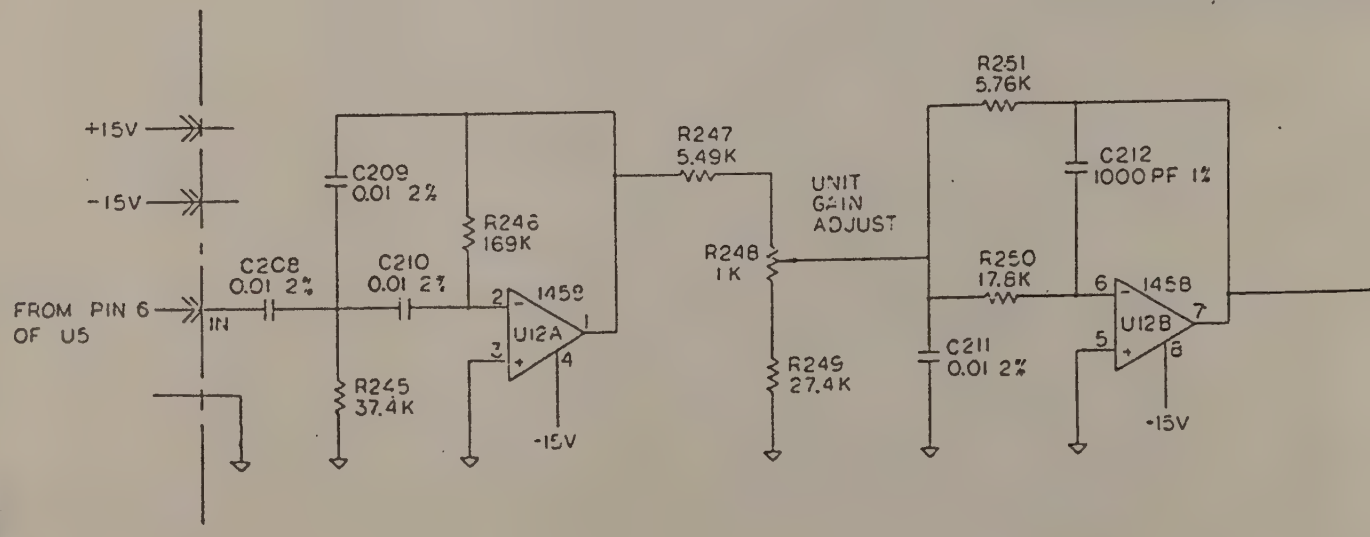


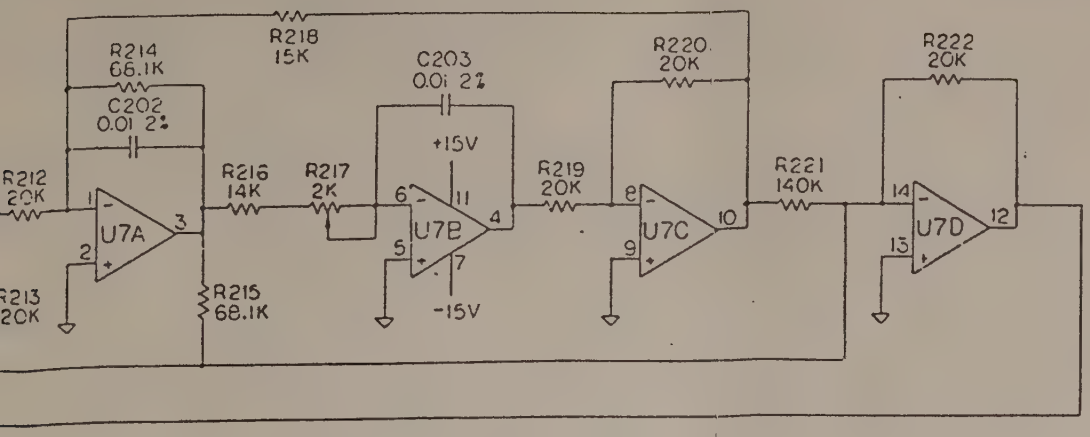
TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± — ± — ± —	DESIGN DEVELOPMENT INC.		
APPROVALS	DATE	MODEL 100R-4 FILTER CKT. SCHEMATIC DRAWING	
DRAWN CP	1/12/82		
CHECKED	2/12/82	SCALE NONE	SIZE C
		DRAWING NO. 80-6740-100B	
		DO NOT SCALE DRAWING	SHEET 4 OF 6

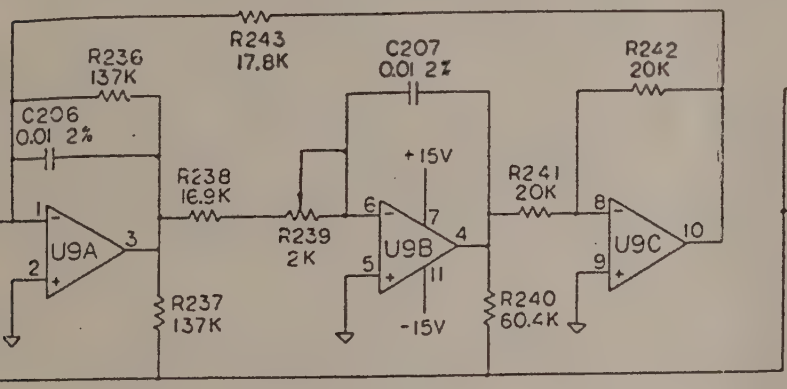
1010 HZ NOTCH FIL



0.2-5 KHZ BAND PASS F







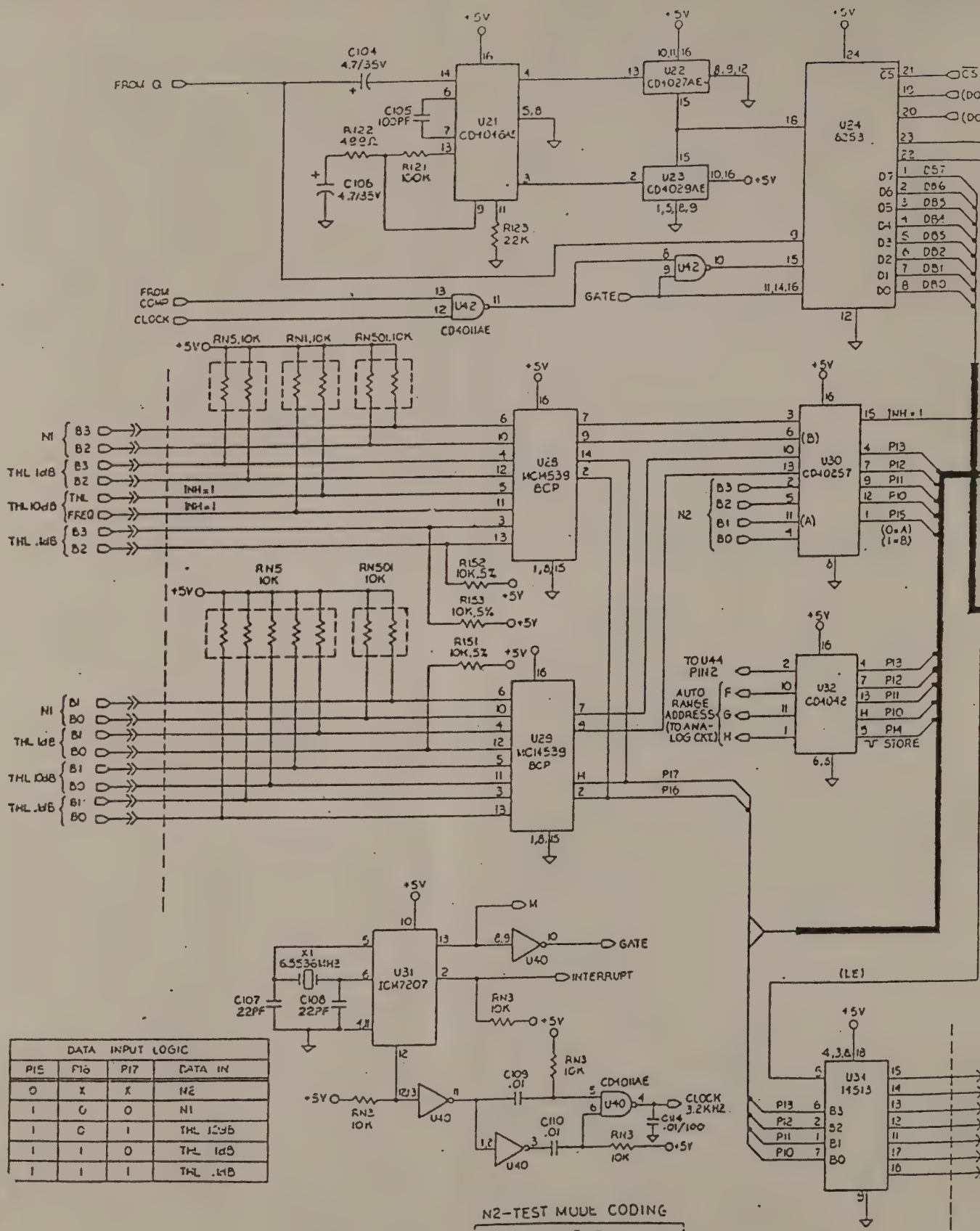
TO Q9 OUT

BAND PASS

TO PIN 1 OF U14 OUT

NOTE:
1) ALL RESISTORS ARE METAL FILM ¼ W, 1%
2) ALL OPERATIONAL AMPLIFIERS ARE RC4136 UNLESS OTHERWISE SPECIFIED.
3) U6, 7, 8, 9 = UA4136PC

DESIGN DEVELOPMENT
SCHEMATIC DIAGRA
100R-4 NOTCHE B.P FILTE
SIZE D
DRAWING NO 8C-8740-10C
DO NOT SCALE DRAWING



DATA INPUT LOGIC			
P15	P16	P17	DATA IN
0	X	X	N2
1	0	0	N1
1	0	1	THL 10dB
1	1	0	THL 1dB
1	1	1	THL .1dB

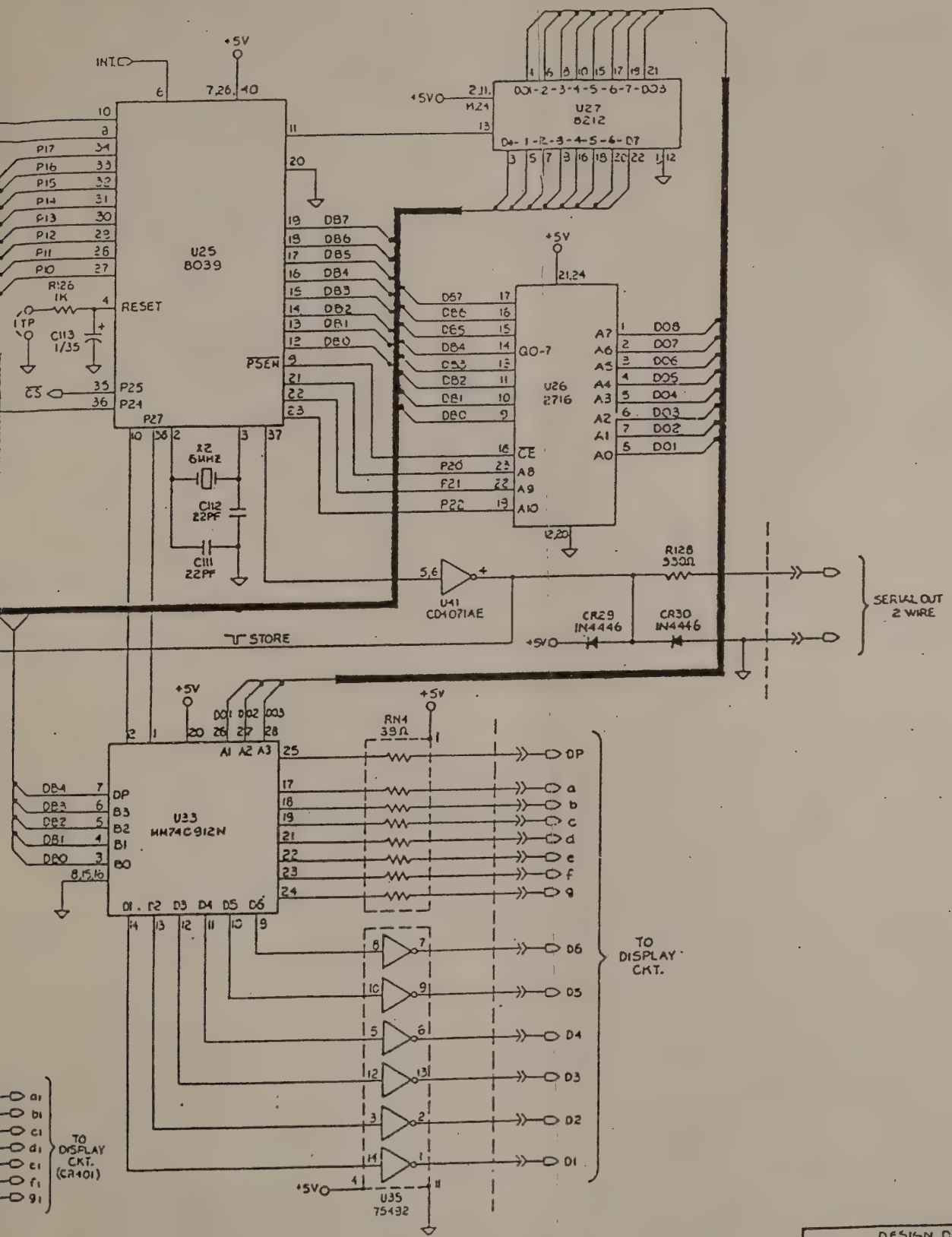
N2-TEST MODE CODING

0 0 0 0 = LEVEL
0 0 0 1 = NOISE
0 0 1 0 = RET. LOSS
0 1 0 1 = NOISE TO GND

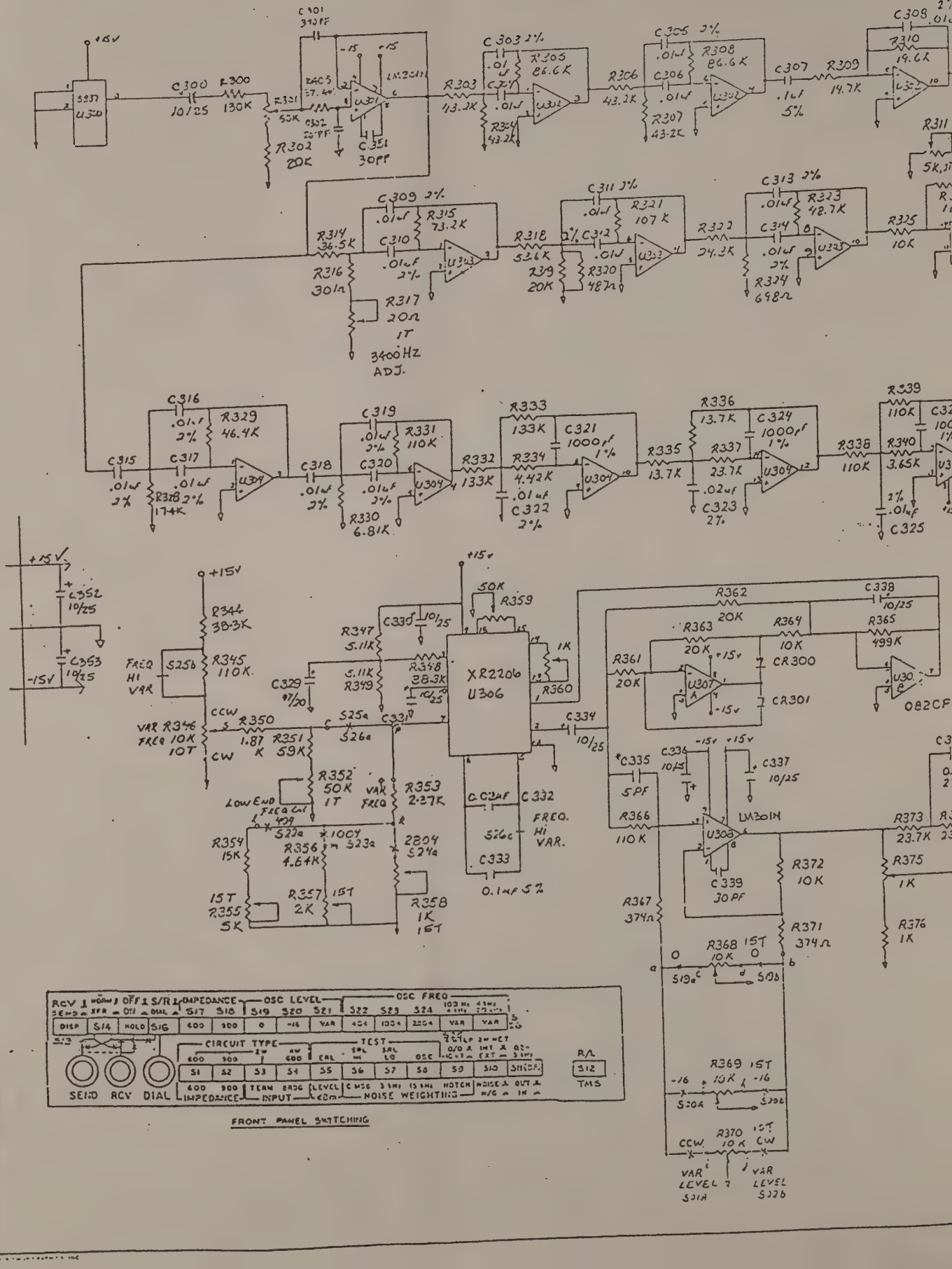
R153, C113, X2, CR30, RN501, U43.

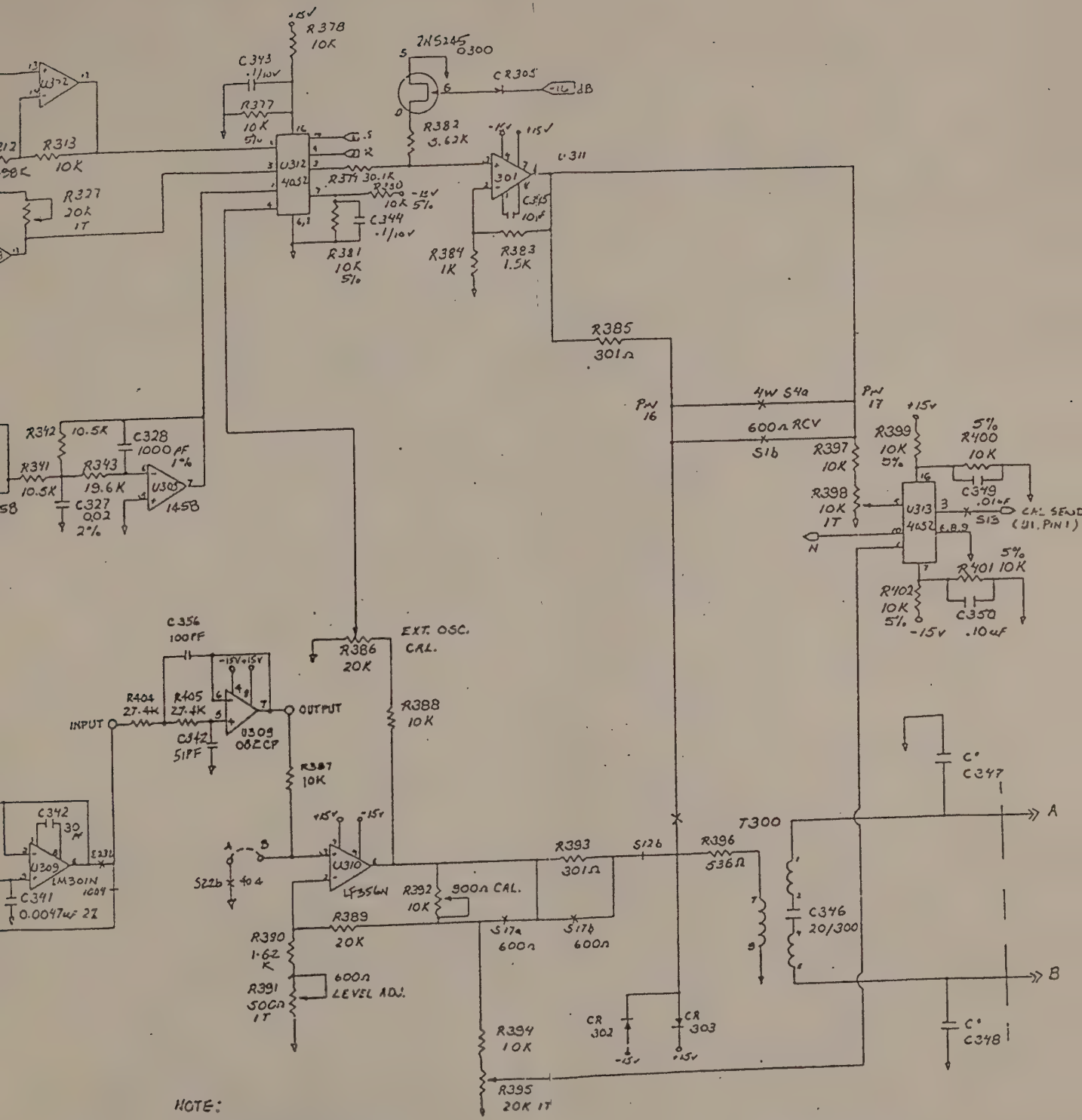
1. LAST REFERENCE DESIGNATIONS USED:

NOTES: UNLESS OTHERWISE SPECIFIED.



DESIGN DEVELOPMENT INC SUNNYVALE, CALIFORNIA		
4/6/82	CP	
NONE		
100R-4 DIGITAL, SCHEMATIC		
SC-6740-1009		6 C

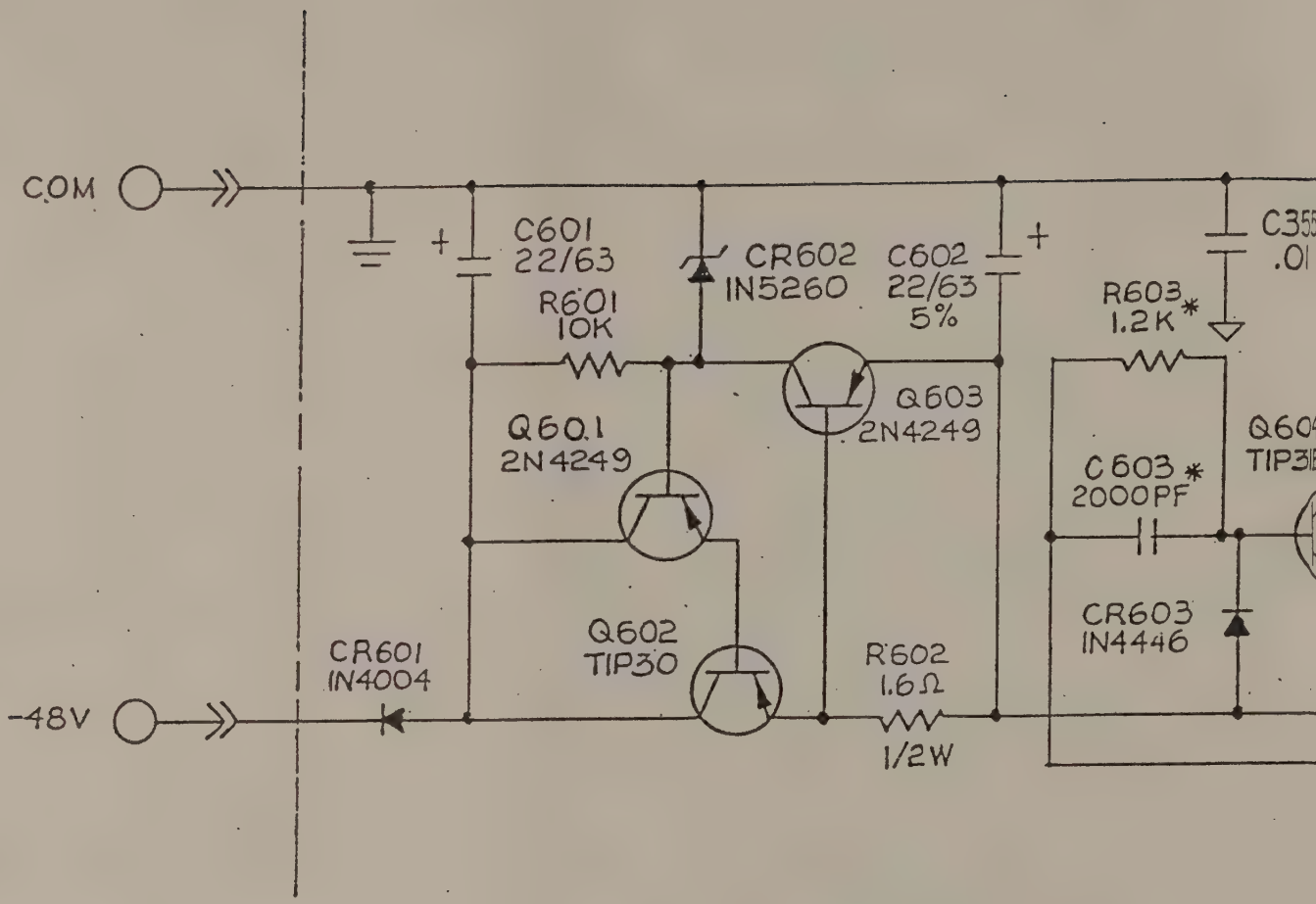

+16V
C300
10/25
R300
130K
R301
50K
R302
20K
C301
390PF
C302
20PF
C351
30PF
U301
LM2011
C303 2%
R303
43.2K
R304
43.2K
R305
86.6K
C305 2%
R306
43.2K
R307
43.2K
R308
86.6K
C307
.1uf
5%
R309
14.7K
C308
R310
19.6K
R311
5K
C309 2%
R314
36.5K
R315
73.2K
C310
R316
301Ω
R317
20Ω
1T
3400Hz
ADJ.
R318
324K
R319
20K
C311 2%
R320
487Ω
R321
107K
C312
R322
24.3K
C313 2%
R323
48.7K
C314
R324
698Ω
R325
10K
C315
.01uf
2%
C316
R329
46.4K
C317
R328
174K
C318
C319
R331
110K
C320
R330
6.81K
R332
133K
R333
133K
C321
1000pf
1%
R334
4.42K
C322
2%
R335
13.7K
R336
13.7K
C324
1000pf
1%
R337
23.7K
C323
2%
R338
110K
R339
110K
R340
3.65K
C325
+15V
-15V
C352
10/25
C353
10/25
R344
38.3K
R345
110K
FREQ HI VAR
S25b
CCW
VAR FREQ
R346
10K
10T
CW
R350
1.87K
R351
59K
S25a
S26a
C329
R347
5.11K
R349
5.11K
C330
10/25
R348
38.3K
R359
50K
XR2206
U306
R360
1K
C331
C334
10/25
R352
50K
1T
VAR FREQ
R353
2.37K
LOW END FREQ CAL
R354
15K
R355
5K
R356
4.64K
R357
2K
S22a
S23a
S24a
2804
R358
1K
1%
C332
FREQ. HI VAR.
S26c
C333
0.1uf 5%
R362
20K
R363
20K
R364
10K
R365
499K
C338
10/25
R361
20K
U307
CR300
CR301
U308
LM301N
C335
5PF
C336
10/25
C337
10/25
R366
110K
C339
30PF
R367
374Ω
R368
10K
1ST
R369
10K
1ST
R370
10K
1ST
R371
374Ω
R372
10K
R373
23.7K
R375
1K
R376
1K
S19a
S19b
S20a
S20b
VAR LEVEL S21A
VAR LEVEL S21B
RCV
SEND
OFF
S/R
IMPEDANCE
OSC LEVEL
OSC FREQ
DISP
S14
HOLD
S16
600
900
0
-16
VAR
404
1004
2204
VAR
VAR
CIRCUIT TYPE
TEST
S1
S2
S3
S4
S5
S6
S7
S8
S9
S10
S11(OPT)
SEND
RCV
DIAL
TERM IMPEDANCE
BRDG INPUT
LEVEL
NOISE WEIGHTING
NOISE
OUT
RA
312
TMS
FRONT PANEL SWITCHING



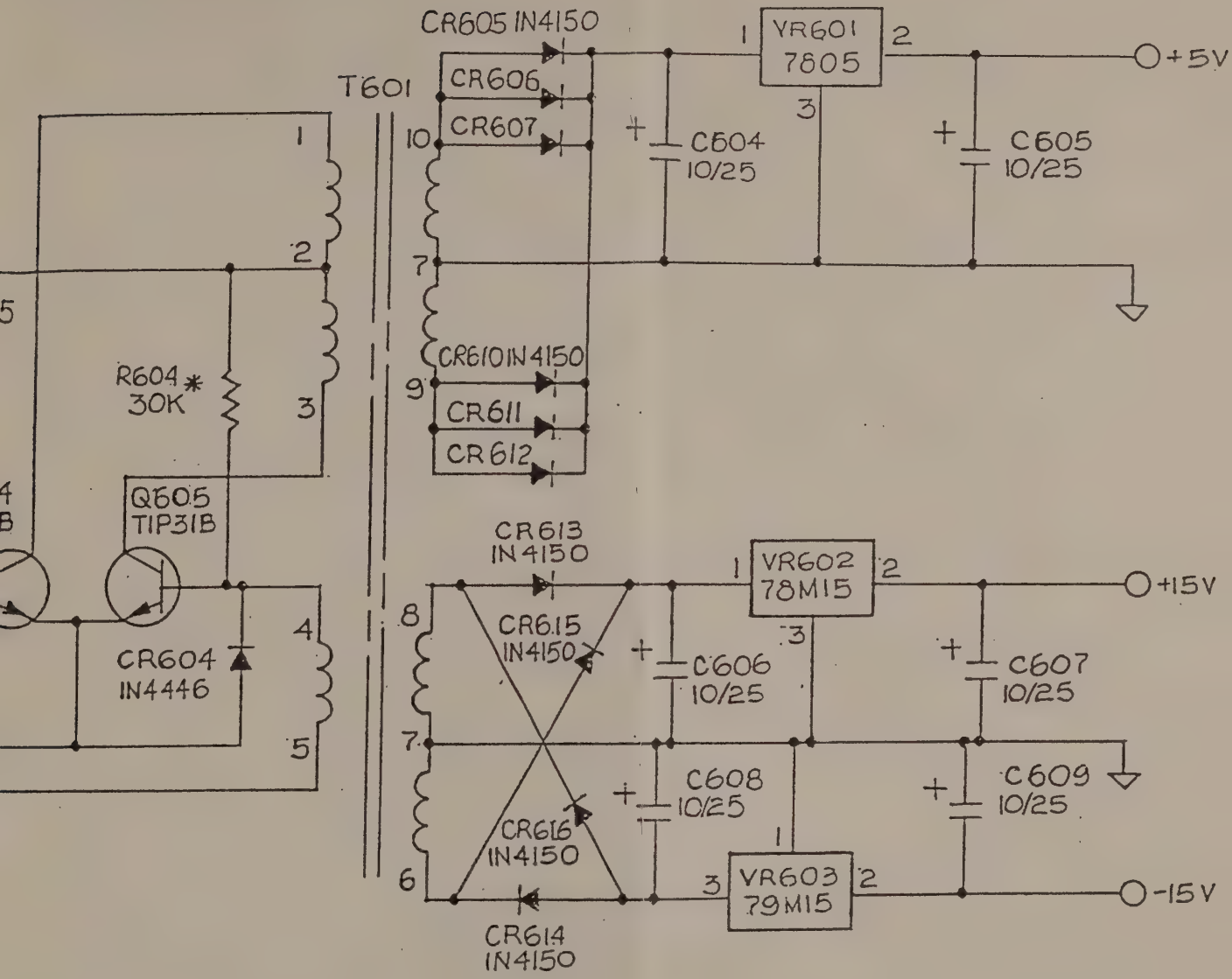
NOTE:

1) ALL RESISTORS ARE M.F. 1% 1/4 W OTHERWISE SPECIFIED.
2) ALL DIODES ARE IN4446 OTHERWISE SPECIFIED.
3) U302, 303, AND 305 ARE XR4136FC

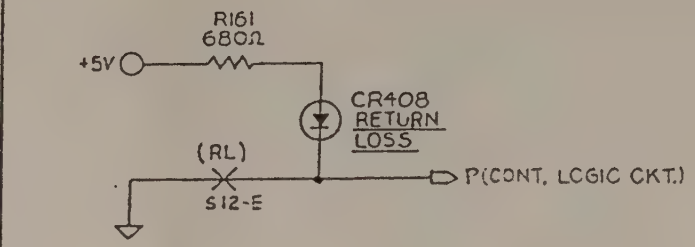
DESIGN DEVELOPMENT INC			
SCHEMATIC DIAGRA			
100R-4 X-MITTER C			
SCALE NONE	SIZE D	DRAWING NO 80-6740-10	
DO NOT SCALE DRAWING		SHEET 1	

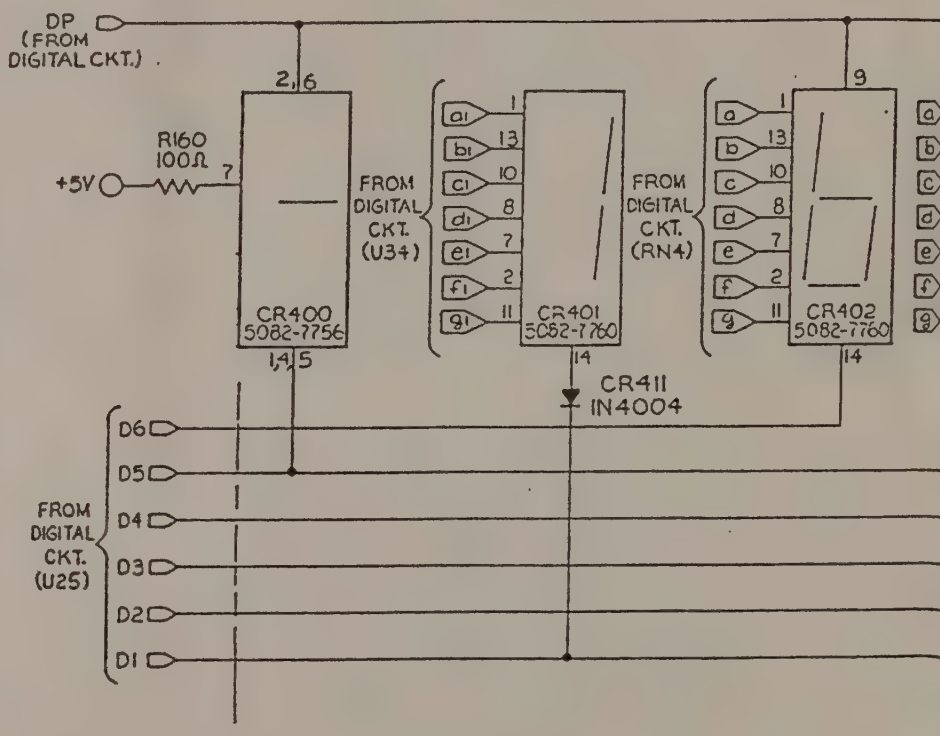

COM
-48V
C601
22/63
R601
10K
CR602
IN5260
C602
22/63
5%
R603
1.2K*
C35
.01
Q603
2N4249
Q601
2N4249
C603*
2000PF
Q60
TIP3
CR603
IN4446
CR601
IN4004
Q602
TIP30
R602
1.6Ω
1/2W

LTR	DESCRIPTION	DATE	APPRO

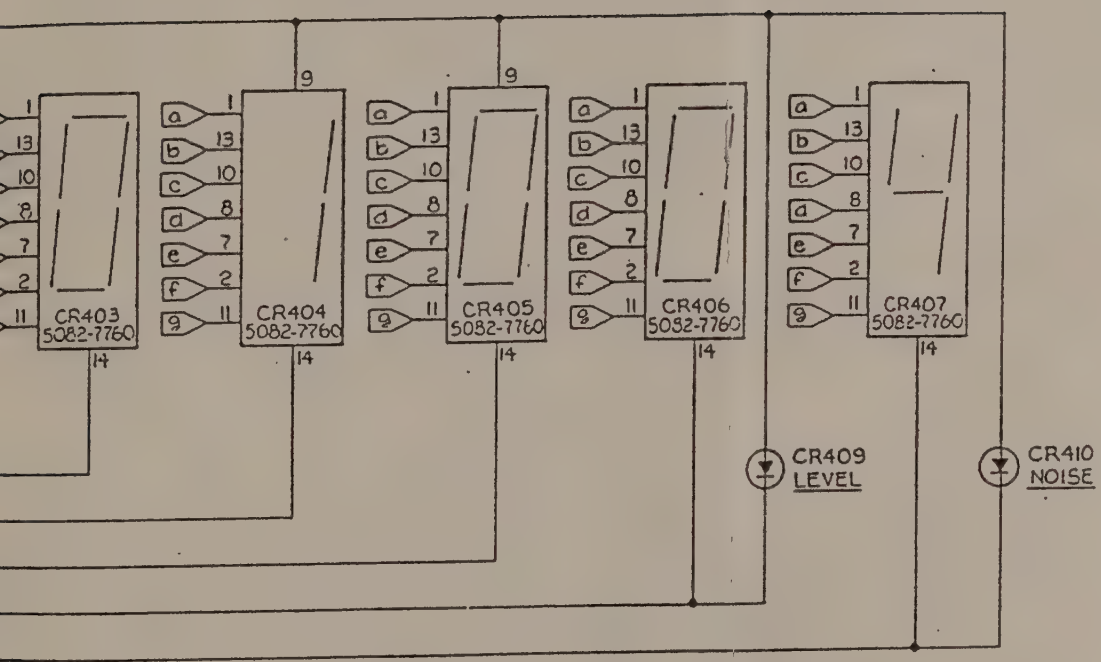


TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ___ ± ___ ± __		DESIGN DEVELOPMENT INC.	
APPROVALS	DATE	SCHEMATIC DIAGRAM 100R-4 POWER SUPPLY CKT	
DRAWN CP	1/15/82		
CHECKED		SCALE NONE	SIZE B
		DRAWING NO. 80-6740-1010	
		DO NOT SCALE DRAWING	SHEET 2 OF 2

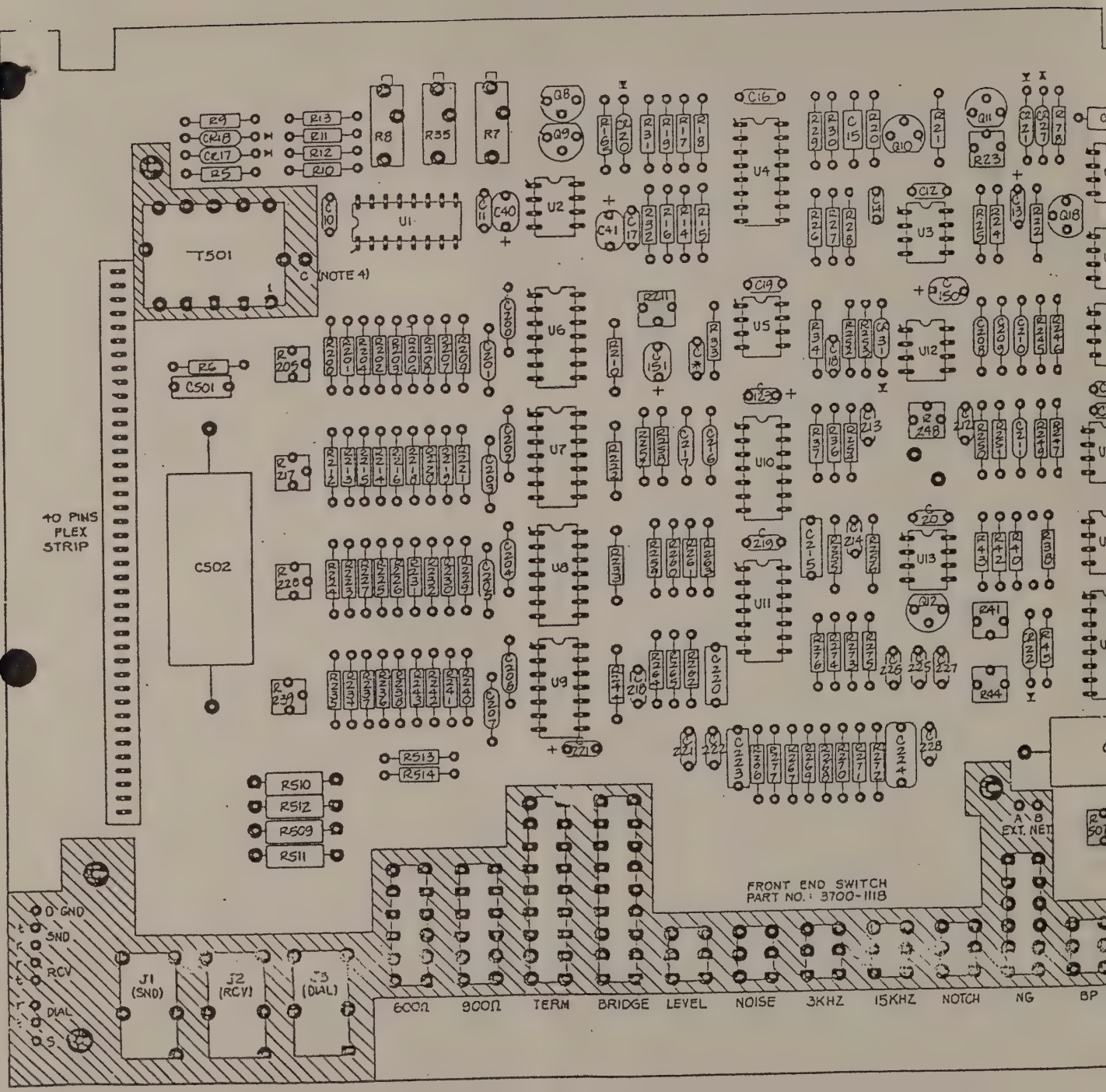

R161
680Ω
+5V
CR408
RETURN
LOSS
(RL)
S12-E
P(CONT. LOGIC CKT.)


DP
(FROM
DIGITAL CKT.)
2,6
R160
100Ω
+5V
7
CR400
5082-7756
1,4,5
FROM
DIGITAL
CKT.
(U34)
a1
b1
c1
d1
e1
f1
g1
CR401
5082-7760
14
FROM
DIGITAL
CKT.
(RN4)
a
b
c
d
e
f
g
9
CR402
5082-7760
14
CR411
IN4004
D6
D5
D4
D3
D2
D1
FROM
DIGITAL
CKT.
(U25)

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

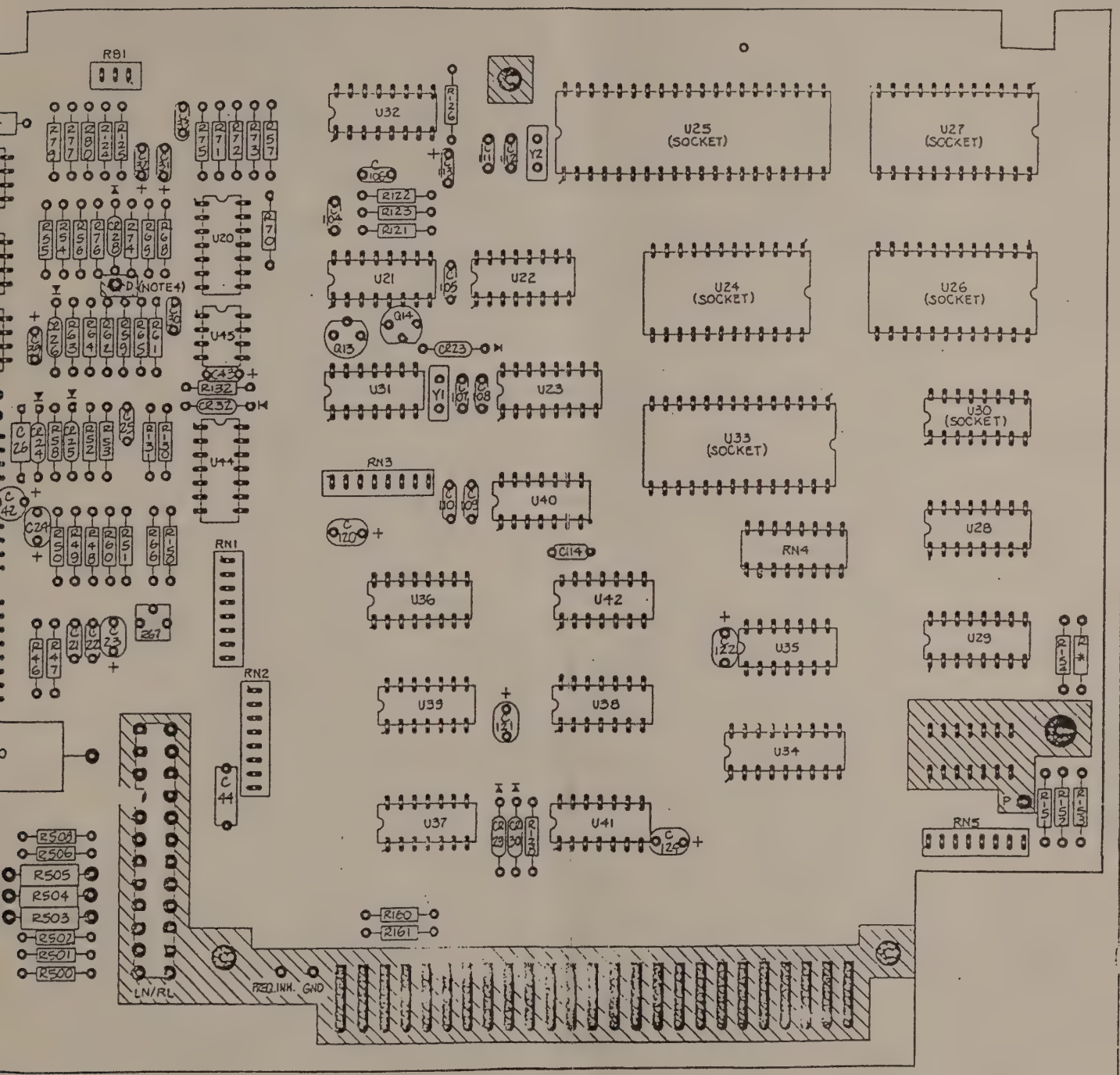


TOLERANCES UNLESS OTHERWISE SPECIFIED		DESIGN DEVELOPMENT INC. SUNNYVALE, CALIFORNIA		
FRACTIONS DEC ANGLES		SCHEMATIC DRAWING 100R-4 DISPLAY CKT.		
APPROVALS	DATE			
DRAWN CP	4/7/82	SCALE NONE	SIZE C	DRAWING NO. 80-6740-1011
CHECKED	4/12	DO NOT SCALE DRAWING		SHEET 1 OF 1

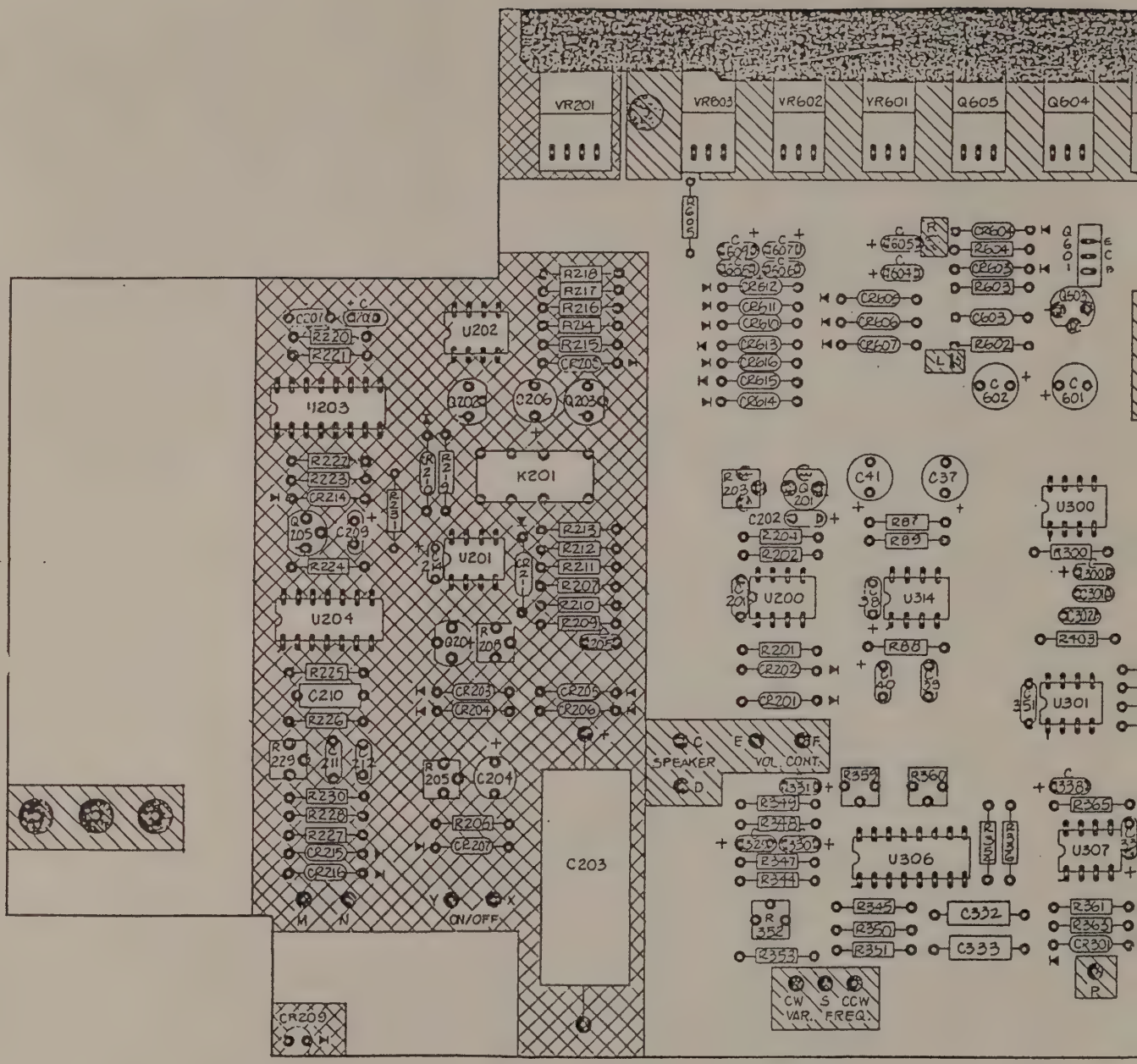


NOTES: UNLESS OTHERWISE SPECIFIED.

1. SHADED AREAS ARE TO TAPED BEFORE GOING THROUGH WAVE SOLDER ▨.
2. T501, J1, J2, J3, AND ALL THE SWITCHES ARE TO HAND-SOLDERED.
3. USE SOCKETS FOR U24, 25, 26, 27, 30 & U33.
4. CONNECT PIN "C" TO PIN "D" USING THE GREEN JUMPER CABLE.
5. * : OPTIONAL COMPONENT.

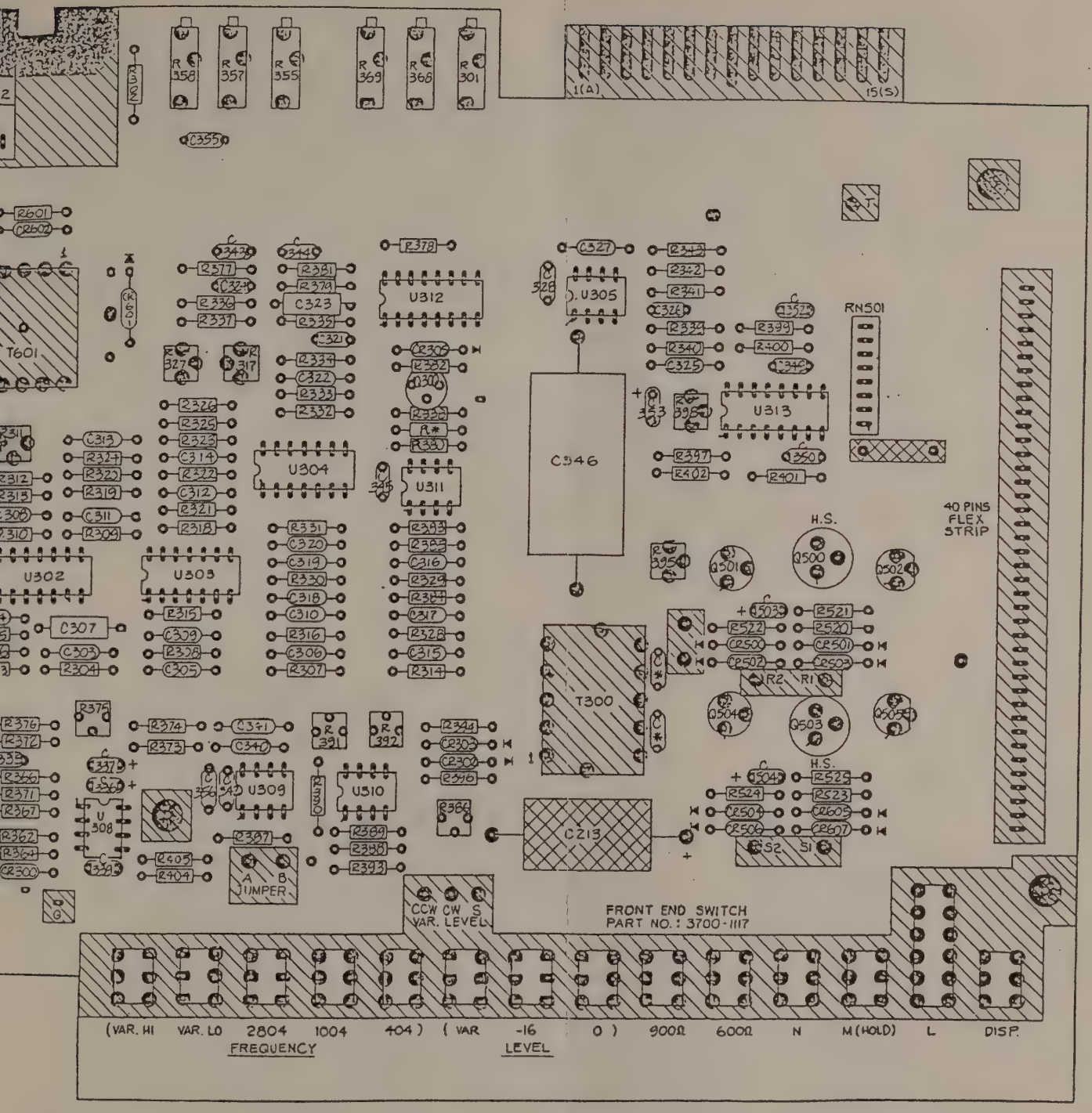


TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES		DESIGN DEVELOPMENT INC. SUNNYVALE, CALIFORNIA
APPROVALS	DATE	LOADING DIAGRAM 100P-4,100R-4,5,6 MAIN
C P	1/17/73	
	1/17/73	SCALE NONE · SIZE D · DRAWING NO. 30-[illegible] 1003
ISSUE		DO NOT SCALE DRAWING · SHEET 1 OF 1

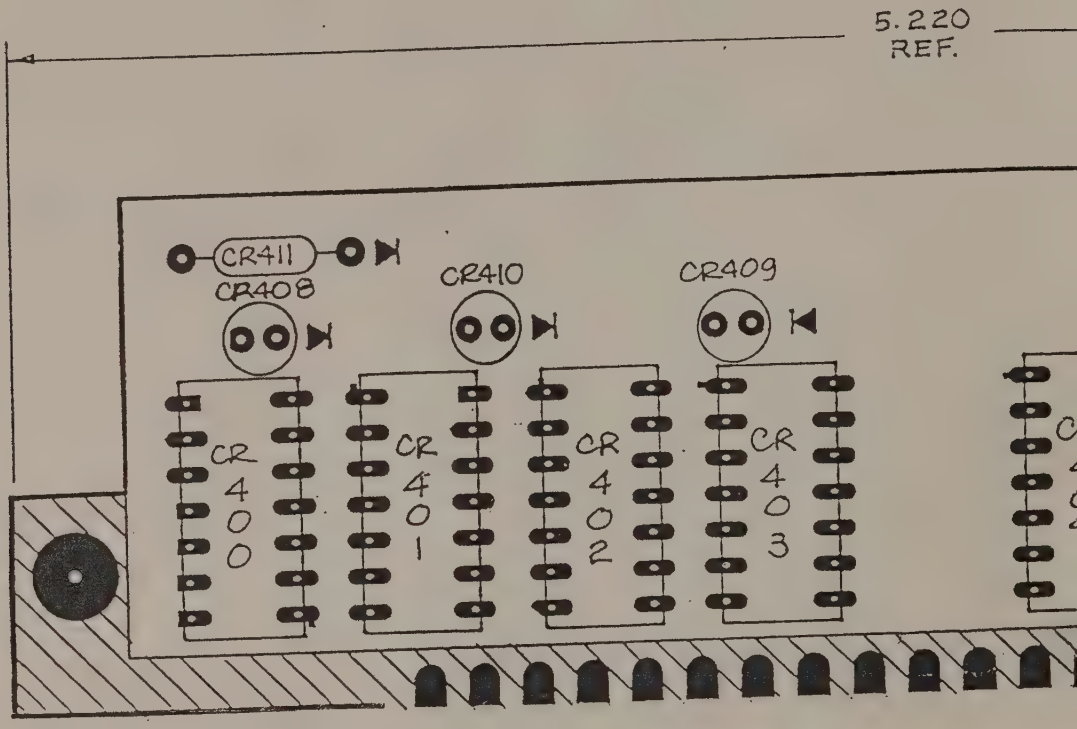


NOTES: UNLESS OTHERWISE SPECIFIED.

1. SHADED AREAS ARE TO TAPED BEFORE GOING THROUGH WAVE SOLDER ▨.
2. T300, T601, AND ALL THE SWITCHES ARE TO HAND-SOLDERED.
3. USED FAN-TYPE HEAT-SINKS FOR Q500 & Q503.
4. VR201, VR603, VR602, VR601, Q605, Q604 & Q602 ARE TO INSTALLED AFTER GOING THROUGH WAVE SOLDER.
5. CROSSED OUT AREAS ARE NOT TO LOADED ▩.
6. * : OPTIONAL COMPONENT.



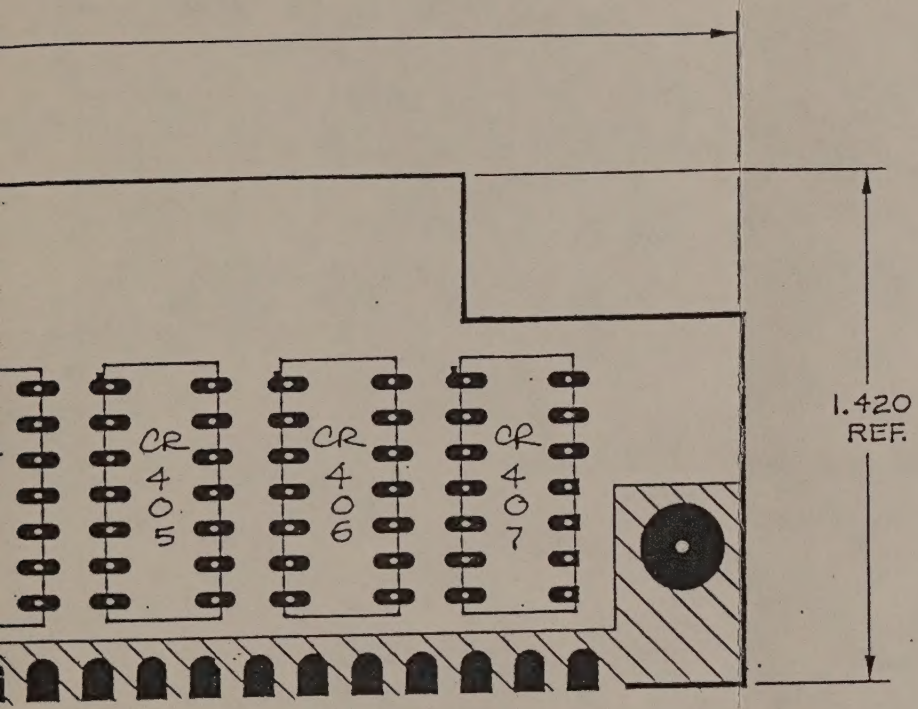
TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES		DESIGN DEVELOPMENT INC. SUNNYVALE, CALIFORNIA
APPROVALS	DATE	LOADING DIAGRAM 100R-4 TRANSMITTER
DRAWN C.P.	7/15/84	
CHECKED		SCALE NONE
		SIZE D
		DRAWING NO. 2C-6210-101
ISSUE 8		DO NOT SCALE DRAWING SHEET 1 OF 1



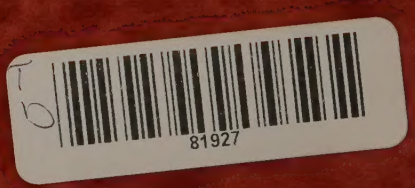
NOTES: UNLESS OTHERWISE SPECIFIED.

1. SHADED AREAS ARE TO TAPED BEFORE GOING THROUGH WAVE SOLDER ▨.
2. MAXIMUM HEIGHT FROM P.C.B.'S SURFACE TO THE TIP OF SMALL L.E.D (CR408, CR409 & CR410) IS 5/8".
3. LARGE L.E.D'S ACTUAL VIEW:
   A. CR400 B. CR401 - CR407

REVISIONS				
LTR		DESCRIPTION	DATE	APPROVED



TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±		DESIGN DEVELOPMENT INC. SUNNYVALE, CALIFORNIA		
APPROVALS	DATE	LOADING DIAGRAM 100R-4 DISPLAY, ISSUE 6		
DRAWN CP	6/30/83			
CHECKED		SCALE NONE	SIZE B	DRAWING NO. 8344-1011
		DO NOT SCALE DRAWING		SHEET 3 OF 3


81927